Humacao Regional Wastewater Treatment Plant
Technically Based Local Limits

Draft

January 2023

Puerto Rico Aqueduct and Sewer Authority

Contents

Abbreviations and Acronyms

°C	degree(s) Celsius
°F	degree(s) Fahrenheit
ACGIH	American Conference of Government Industrial Hygienists
AHL	allowable headworks loading
BMP	best management practice
BOD_5	5-day biochemical oxygen demand
BPJ	best professional judgement
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FOG	Fats, Oils, and Grease
lb/d	pound(s) per day
LEL	lower explosive limit
µg/L	microgram(s) per liter
MAHL	Maximum Allowable Headworks Loading
MAIL	Maximum Allowable Industrial Loading
MBAS	methylene blue active substances
MDL	method detection limit
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
mgd	million gallon(s) per day
ML	Method Limit
NAICS	North American Industry Classification System
No.	number
NO_3	nitrate
NO_2	nitrite
NPDES	National Pollutant Discharge Elimination System
PAH	polyaromatic hydrocarbon
PCB	polychlorinated biphenyl
POC	pollutant of concern
POTW	publicly owned treatment works
PRASA	Puerto Rico Aqueduct and Sewer Authority
PRWQS	Puerto Rico Water Quality Standard(s)
PRWQSR	Puerto Rico Water Quality Standards Regulation
QA/QC	quality assurance and quality control
RL	Reporting Limit
RWWTP	Regional Wastewater Treatment Plant
SIC	Standard Industrial Code
SIU	significant industrial user
SU	standard unit(s)
TBLL	technically based local limit
TCLP	Toxicity Leaching Procedure/also Toxicity Leachate Procedure
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TSS	total suspended solids
WQS	water quality standard(s)

Executive Summary

The U.S. Environmental Protection Agency (EPA) regulates compliance with the Clean Water Act (CWA), including section 307(b) pretreatment standards. As part of this function, EPA issues National Pollutant Discharge Elimination System (NPDES) permits to publicly owned treatment works (POTW). These permits contain provisions that require compliance with Title 40 of the Code of Federal Regulations Parts 403 through 471 (40 CFR 403–471) to ensure compliance with pretreatment standards by significant sources introducing pollutants subject to such standards to the POTW (CWA 402(b)(8), 33 U.S.C. § 1342(b)(8) *et seq.*). Requirements to develop technically based local limits (TBLLs) are specified in 40 CFR 403.5 (c).

This TBLL evaluation was prepared to meet NPDES requirements for the Humacao Regional Wastewater Treatment Plant (RWWTP). These limits have been developed in accordance with EPA's Technical Support Document *Local Limits Development Guidance* (EPA 2004) and in accordance with NPDES Permit No. PR0025399-Part IV (A)(1)(b).

In response to these standards, conditions, and requirements, the local limits in Table ES-1 have been developed for the Humacao RWWTP.

Table ES-1. Local Limits Summary

Parameter	Local Limit	Page
Arsenic	0.299 mg/L	See Note a
Cadmium	0.093 mg/L	See Note a
Chromium	28.41 mg/L	See Note a
Copper	1.86 mg/L	See Note a
Cyanide (Free)	0.271 mg/L	See Note a
Silver	0.635 mg/L	See Note a
Lead	0.824 mg/L	See Note a
Mercury	0.003 mg/L	See Note a
Nickel	1.327 mg/L	See Note a
Molybdenum	0.155 mg/L	See Note a
Selenium	0.152 mg/L	See Note a
Zinc	1.346 mg/L	See Note a
Flow	No Local Limit Needed	6-1
BOD_5	No Local Limit Needed[c]	6-1
Total Suspended Solids (TSS)	No Local Limit Needed[c]	6-1
Total Nitrogen ($TKN+NO_3+NO_2$)	40 mg/L	6-2
Phenols[b]	1.0 mg/L	6-2
pH	6.5–9.0 SU	6-2
Fats, Oils, and Grease (FOG)	50 mg/L total FOG	6-3

Table ES-1. Local Limits Summary

Parameter	Local Limit	Page
Temperature	40°C (104°F) at POTW; 60°C (140°F) from SIU	6-3
Flammability	No two consecutive readings at ≥5% LEL, and no reading of ≥10% LEL allowed	6-3
Total Toxic Organics	No Limit	6-4

[a] Local Limits Calc Page 2 on line 69 of "TBLL Calc-Humacao.xlsm" (Appendix C).
[b] Total phenols minus unsubstituted phenol
[c] Concentrations are set as standards for surcharges. PRASA reserves the right to base increased surcharges on concentrations above normal domestic waste strength, which is set at 250 mg/L for BOD_5 and 250 mg/L for TSS. Surcharges up to 250 mg/L may be subject to the most current calculated cost of treatment per pound of BOD and TSS. High strength waste above 250 mg/L may be subject to increased rates in accordance with need to improve or provide additional infrastructure to meet regulatory requirements for discharge.

°C = degree(s) Celsius
°F = degree(s) Fahrenheit
BOD_5 = 5-day biochemical oxygen demand
mg/L = milligram(s) per liter
LEL = lower explosive limit
TKN = total Kjeldahl nitrogen
NO_3 = nitrate
NO_2 = nitrite
Pt/Co = platinum-cobalt scale
SIU = significant industrial user
SU = standard unit(s)
TSS = total suspended solids

1. Introduction

The Humacao Regional Wastewater Treatment Plant (RWWTP) is located at PR Road 3, Km 77.2, Rio Abajo Ward, Humacao, Puerto Rico. The plant operates under National Pollutant Discharge Elimination System (NPDES) permit number PR0025399. The Industrial Pretreatment Program regulates nine industries that discharge treated waste to the Humacao RWWTP collection system. Seven of the nine industries are classified as categorical significant industrial users (SIUs).

Industrial permits issued to SIUs include local limits that were adopted in 2004. These limits are stricter than the Pretreatment Limits set by the Puerto Rico Aqueduct and Sewer Authority (PRASA) that apply island-wide for most parameters. The prior technical development of these limits used data that are now more than 10 years old to develop the 2004 technically based local limits (TBLLs) and do not reflect modifications and upgrades that have been made to the Humacao RWWTP. Many of the regulatory requirements have changed; the size of the population served and the industrial base also may have changed. In keeping with U.S. Environmental Protection Agency (EPA) policy and local limits methodology, when conditions change, local limits must be re-evaluated using current data and conditions.

This document uses recent test data to develop TBLLs that are specific to current conditions in the Humacao RWWTP collection system. These TBLLs have been established in response to NPDES permit No. PR0025399-Part IV (A)(1)(b).

The following appendices are provided:

- Appendix A Priority Pollutants Detected At or Above MDL
- Appendix B Guidance on the Selection of Pollutants of Concern
- Appendix C Data Sheets Used in “TBLL Calc-Humacao.xlsm”
- Appendix D Puerto Rico Water Quality Standards Worksheet
- Appendix E Average TCLP for Sludge
- Appendix F Phenolic Compounds Regulated by Puerto Rico Water Quality Standards
- Appendix G CPCS Safety Alert
- Appendix H Long-hand Calculation of Arsenic Local Limits
- Appendix I Definitions

2. Local Limits Development Methodology

2.1 Guidance Documents

The following guidance was used to develop the TBLLs presented in this document:

- *Local Limits Development Guidance* (EPA 2004)
- *Guidance Manual on the Development and Implementation of Local Discharge Limitations under the Pretreatment Program*, EPA 833-B-87-202 (EPA 1987)

These documents provide the rationale and legal support for local limits developed in relation to technically based environmental criteria using EPA-approved methodology. The methodology is intended to ensure full compliance at the treatment facility for all identified criteria. The following steps were taken to develop the Humacao RWWTP TBLLs:

1. Characterize the Humacao RWWTP treatment system in terms of regulatory requirements, plant capacity, treatment trains, unit processes, industrial users, and receiving stream characteristics.

2. Using the site characterization from step 1, select regulatory/operational criteria that apply to the specific treatment systems.

3. Select parameters that should be considered for local limit development, referred to as pollutants of concern (POCs).[1] Selection is based on review of historic data and includes a minimum list of EPA-required pollutants. Pollutants selected may be individual elements or compounds, such as metals or halogenated organic compounds, that are discussed in Sections 4 through 6. Additionally, local limits may be aimed at controlling groups of substances that collectively exhibit negative characteristics, such as flammability or toxicity. This second category is discussed in Section 6, Other Limits and Concerns.

4. Upon selection of the POCs, collect and evaluate historic test data or generate new data from sampling and analysis to develop the rationale for the maximum ability of the plant to treat these pollutants while remaining compliant with applicable criteria.

5. Compile test data and model the fate of the pollutants within the collection and treatment system using partitioning coefficients within the plant and physical properties, such as Henry's constants, in the collection system.

6. Conduct standard EPA-accepted calculations for individual elements and compounds discussed in Sections 4 through 6 to determine the maximum pollutant loading that can be allowed at the headworks (allowable headworks loading [AHL]) while remaining compliant with applicable criteria.

7. After applying all calculations for all criteria, use the smallest mass that ensures that environmental and regulatory criteria will be met. This is referred to as the maximum allowable headworks loading (MAHL).

[1] The *Local Limits Development Guidance Manual* (EPA 2004) defines and uses the technical term "Pollutants of Concern (POC)" throughout the document. Consequently, to avoid confusion during the regulatory review process of the TBLL, the term "Pollutants," "Pollutants of Concern," and POC are used throughout this document when referring to parameters considered for local limits development.

8. Subtract the domestic loading and a safety and growth factor from the MAHL; the remaining allowable pollutant loading is the maximum allowable industrial loading (MAIL) available to industry.

9. Once the MAIL has been calculated, allocate the mass to the industries based on one of the prescribed methods found in the *Local Limits Development Guidance* (EPA 2004). These allocations form the basis of the local limits for these pollutants.

10. Develop criteria based on limitations that restrict the magnitude of the negative characteristics exhibited by each type of group for collective groups of pollutants in Section 6.

3. System Characterization, Industrial Users, Receiving Stream, and Applicable Criteria

3.1 Treatment System

The Humacao RWWTP is permitted to discharge a maximum daily flow limit of 13.38 million gallons per day (mgd). Currently, the average monthly flow is approximately 3.89 mgd. Table 3-1 lists the estimated as-built design capabilities as established in the last plant upgrade.

Table 3-1. Humacao RWWTP Estimated Capacities

Item	Daily Permitted Maximum	Monthly Average
Flow[a] (mgd)	13.38	8.24
BOD_5 (lb/d)	16,102	
TSS (lb/d)	21,392	

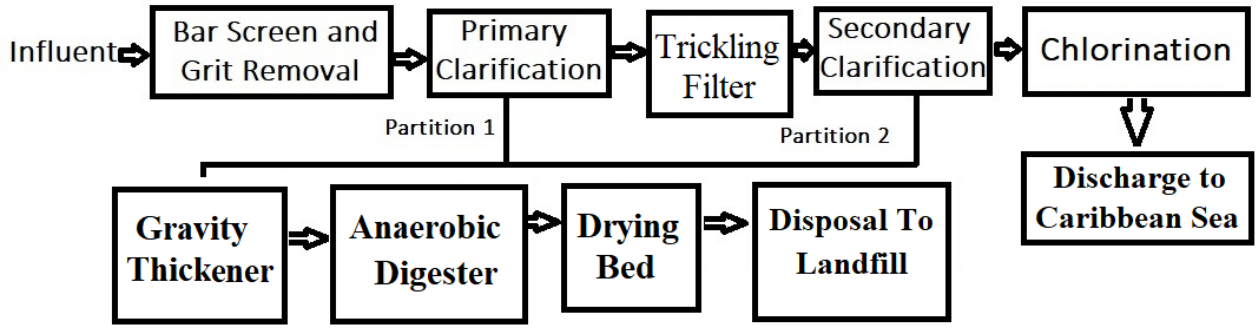
[a] Actual as-built capacity was not available; the permitted flow has been used with medium-strength domestic wastewater from Metcalf and Eddy (2003) to estimate maximum BOD_5 and TSS.
BOD_5 = 5-day biochemical oxygen demand
TSS = total suspended solids

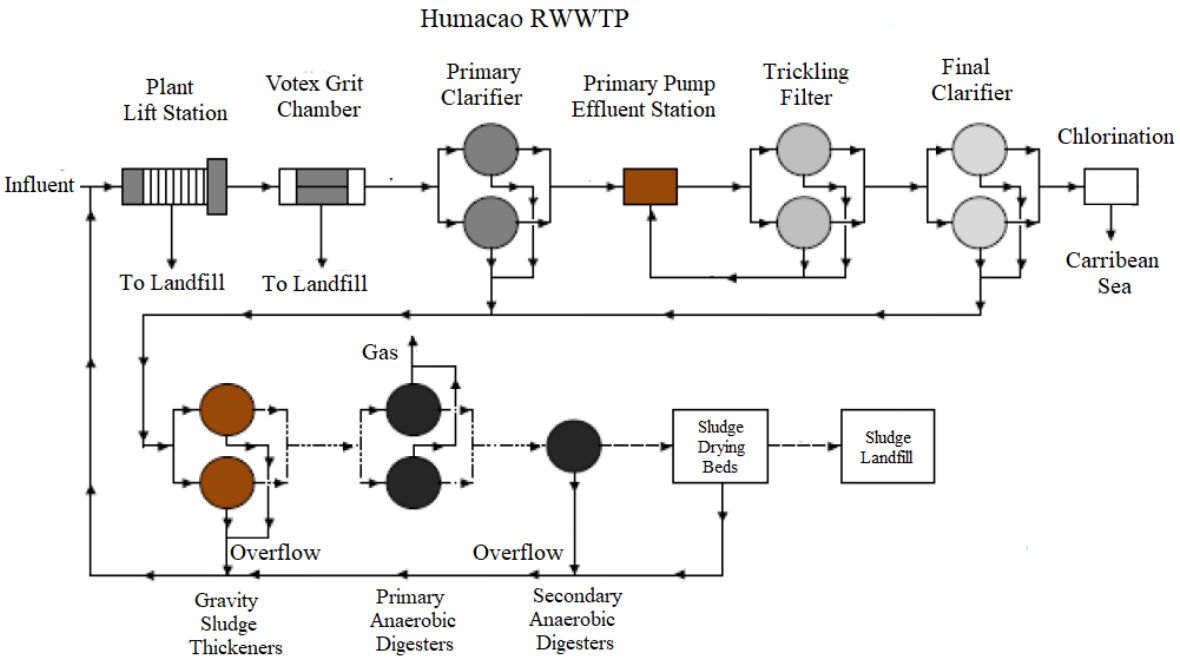
The treatment process consists of mechanical bar screening, influent pumps, grit removal, primary clarification, biofiltration, secondary clarification, and chlorination prior to discharge.

The sludge-handling facilities consist of anaerobic digestion followed by sludge drying beds. The sludge cake is transported by truck and disposed of in an approved landfill. Figure 3-1 shows the treatment train and a schematic of the plant's unit processes (including an aerial view of the facility). The block diagram included on Figure 3-1 shows that two partitioning coefficients (removal factors) after primary clarification and total overall plant removal are present in the system after secondary clarification.

3.2 Industrial Users

PRASA has issued permits to nine SIUs that contribute flow to the Humacao RWWTP. Table 3-2 provides identification data for these SIUs, along with the permitted flow limits. Additional test data for these users are available from PRASA's Industrial Pretreatment Program.





Humacao Regional Wastewater Treatment Plant

Figure 3-1. Humacao RWWTP Treatment Unit Processes and Site Aerial

Table 3-2. Significant Industrial User and Respective Permitted Flows

SIU	Permit No.	Process Description (SIC/NAICS)	Federal Category	Category Description	Authorized Flow (gpd)
Aspen Surgical PR Corp.	GDA-89-609-043	339112 – Surgical and Medical Instruments Manufacturing 339113 – Surgical Appliance and Supplies Manufacturing	410, Subpart E	Textile Mills Point Source Category	30,000
Bard Shannon, LTD	GDA-06-607-001	339112 – Surgical and Medical Instruments Manufacturing	N/A	N/A	53,200
Bristol-Myers Squibb Manufacturing Company	GDA-88-607-031	325412 – Pharmaceutical Preparation Manufacturing	439, Subpart D	Pharmaceutical Manufacturing Point Source	500,300
Century Packing Corp.	GDA-10-609-002	311612 – Meat Processed from Carcasses	432, Subpart G	Meats Products Point Source	37,800
Combe Products, Inc.	GDA-01-611-064	325412 – Pharmaceutical Preparation Manufacturing	439, Subpart D	Pharmaceutical Manufacturing Point Source	28,000
El Coqui Landfill Co., Inc.	GDA-07-607-003	562212 – Solid Waste Landfill	N/A	N/A	126,000
McNeil Healthcare, LLC	GDA-95-609-086	325412 – Pharmaceutical Preparation Manufacturing	439, Subpart D	Pharmaceutical Manufacturing Point Source	150,000
Medtronic PR Operations Spinal 1	GDA-91-607-057	339112 – Surgical and Medical Instrument Manufacturing	433, Subpart A	Metal Finishing Point Source	30,000
MSD International GmbH (Puerto Rico Branch) LLC	GDA-94-609-082	325412 – Pharmaceutical Preparation Manufacturing 325414 – Biological Product (except Diagnostic) Manufacturing	439, Subpart D	Pharmaceutical Manufacturing Point Source	122,000
Galephar PR, Inc.[a]	TBD		NA		148,000
				Total Authorized Flow	**1,225,300**

Table 3-2. Significant Industrial User and Respective Permitted Flows

SIU	Permit No.	Process Description (SIC/NAICS)	Federal Category	Category Description	Authorized Flow (gpd)

[a] Currently being permitted.
gpd = gallon(s) per day
NAIC = North American Industry Classification System
No. = number
SIC = Standard Industrial Code

3.3 Receiving Stream

The Humacao RWWTP effluent discharges to the Caribbean Sea. The Caribbean Sea is listed in the current NPDES permit as a Class SC water.[2] After primary and secondary treatment, effluent from this facility is conveyed approximately 6,250 feet offshore via a 48-inch-diameter outfall pipe. The seaward end of the outfall is fitted with a "Y"-shaped, multiport diffuser discharging at a depth of approximately 35 feet below mean sea level. Each leg of the diffuser has three 10-inch risers on a 30-inch barrel. Each riser has two 6-inch ports discharging perpendicularly to the diffuser in opposite directions. The NPDES authorized mixing zone dilution allowance for this discharge is 84:1.

3.4 Applicable Criteria

Using the site characterization, industrial base, and regulatory/operational considerations applicable to this treatment system, the Humacao RWWTP is subject to the following criteria:

- Water quality standards
- NPDES permit limits
- Biosolids regulations for disposal
- Worker health and safety (toxicity, flammability, and explosivity)
- Plant capacity
- Other applicable best professional judgment (BPJ)

These criteria were used to select the POCs and are further discussed in Section 4.

[2] The April 2019 modifications to the Puerto Rico Water Quality Standards Regulation changed the receiving water category for this discharge from Class SC to Class SB.

4. POC Selection, and Sampling and Analysis

4.1 POC Selection

Toxic pollutants selected for these derivations consist of the EPA national pollutant-mandated list of 11 required metals plus cyanide. Chromium has been examined as total chromium. Additionally, EPA lists BOD_5, TSS, and ammonia as pollutants that should be discussed. Ammonia is discussed as total nitrogen (TN) since TN is found as a NPDES limit. Flow, pH, flammability, temperature, phenols, and fats, oils, , and grease (FOG) are discussed in relation to protecting the treatment works, the collection system, and workers. A criterion exists for phenol compounds in the Puerto Rico General Limits; consequently, phenols are considered as a POC.

Historical test data points from January 1, 2017, to February 1, 2022, were reviewed for the Humacao RWWTP effluent and sludge samples. This review did not identify POCs other than those discussed previously. Because the database contained limited testing for organic pollutants, priority pollutant scans were added to the site-specific testing to determine whether toxic organic pollutants were present in the system. Table 4-1 provides the full list of parameters selected for evaluation.

Table 4-1. Pollutants Selected for Local Limits Evaluation

Arsenic	Flammability	Selenium
BOD_5	Flow	Silver
Cadmium	FOG	Temperature
Chromium, Total	Lead	Total Nitrogen ($TKN+NO_3+NO_2$)
Copper	Mercury	TSS
Cyanide (Free)	Molybdenum	Zinc
Phenols	Nickel	
	pH	

TKN = total Kjeldahl nitrogen
NO_3 = nitrate
NO_2 = nitrite

4.2 Sampling and Analysis

The historical database does not include concurrent sampling of influent and effluent locations. Concurrent sampling is necessary to develop partitioning coefficients (removal factors) for conservative pollutants (metals). Sampling must be conducted concurrently at specific sites in the treatment system (including the collection system prior to the plant) to understand and determine how the pollutants will be either removed via sludge or discharged into the receiving waters. This ratio of removal is known as *removal rate*, *removal coefficient*, or *partitioning coefficient*.

Concurrent sampling in the Humacao RWWTP treatment system was conducted from January 2 to 16, 2022. Tables 4-2 and 4-3 list the testing schedules. Per EPA's *Local Limit Development Guidance* (EPA 2004), composite sampling was conducted for fourteen consecutive days for all tests, except cyanide, which (as a non-conservative parameter) was taken as a series of grab samples. Table 4-4 lists pollutants included in the testing regimen. Laboratory analytical methods with the appropriate sensitivity

and quality assurance and quality control (QA/QC)[3] were required. The laboratory analytical results exceeded data reporting requirements. Where the best testing methods available were insufficient to generate removal factors, the *Local Limits Development Guidance* (EPA 2004), which provides default values (book values), was used as an alternative. Instances where book values were used are noted and discussed.

Table 4-2. Week 1 Sample Schedule

Location	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Influent	1	1	1	1	1	1	1
Final Effluent		1	1	1	1	1	1
Primary Effluent		1			1		
Sludge			1		1		
Domestic							
Total	1	3	3	2	4	2	2

Table 4-1. Week 2 Sample Schedule

Location	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Influent	1	1	1		1	1	1	
Effluent	1	1	1	1	1	1	1	1
Primary Effluent			1			1		
Sludge				1		1		
Domestic								
Total	2	2	3	2	2	4	2	1

Table 4-4. Test to Perform on Each Sample

Pollutant	Sample Location				
	Influent	Effluent	Primary Effluent	Sludge	Domestic
Arsenic	X	X	X	X	X
Cadmium	X	X	X	X	X
Chromium Total	X	X	X	X	X
Copper	X	X	X	X	X
Cyanide (Free)	X	X	X		X
Lead	X	X	X	X	X

[3] Original laboratory reports (more than 4,000 pages) have not been included herein, but are available upon request.

Table 4-4. Test to Perform on Each Sample

Pollutant	Sample Location				
	Influent	Effluent	Primary Effluent	Sludge	Domestic
Nickel	X	X	X	X	X
Mercury	X	X	X	X	X
Selenium	X	X	X	X	X
Silver	X	X	X	X	X
Zinc	X	X	X	X	X
Nitrogen (NH_3, NO_3, NO_2)	X	X			
% Solids				X	
Priority Pollutants	X	X			

NH_3 = ammonia

The calculations in this document show that industrial test data were not required for any of the standard calculations. Cyanide testing was not conducted in the sludge samples because of the non-conservative nature of cyanide and the lack of a disposal criterion.[4]

Appendix A provides influent and effluent priority pollutant test data that show results at or above the method detection limits (MDLs). Using guidance found in the *Guidance Manual on the Development and Implementation of Local Discharge Limitations under the Pretreatment Program* (EPA 1987) (summarized in Appendix B), no organic pollutant qualified as a POC.

Table 4-5 lists the laboratories that conducted the testing.

Table 4-5. Laboratories Used for Testing

POC	Lab
Cyanide	Specialty Analytical
Metals, Dioxin, Organic Pesticides, PAHs, PCBs, Priority Pollutants 624/625, Nitrogen	ALS Environmental

PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl

[4] Cyanide does not collect in the sludge. Instead, cyanide reduction occurs in the wastewater treatment process because some microbiota use it as a food source. When cyanide predominates over time, these organisms proliferate, and the plant acclimatizes to the presence of cyanide, allowing for treatment of this toxic material. For this reason, 40 CFR 503 does not list a cyanide limit in its disposal criteria.

5. Data Compilation and Analysis

5.1 Data Compilation

Test data generated from each laboratory were reviewed and verified using data qualifiers and laboratory data QA/QC documentation. All data greater than the method limit (ML) (equivalent to the lowest standard used to calibrate the analytical method) were used to develop estimated removal efficiencies. If any data point for either the influent or the effluent was less than the ML, per EPA guidance, one-half the ML was used. The lab reports a reporting limit (RL) for each parameter. Jacobs confirmed that the reported RLs followed the methodology to produce valid MLs using standards at the levels specified. Domestic samples are typically taken from low-flow areas, which are not representative of the flow entering the plant. As an alternative, the test data from the influent are used to represent domestic contributions. In this method, referred to as "domestic approximation," the data used for domestic contributions consist of all dischargers, including domestic, commercial, and industrial. Use of these data is a conservative assumption. These data, along with data on other pollutants, were entered into a spreadsheet titled "TBLL Calc-Humacao.xlsm"[5] that automates the calculation of limits as described in the following. Appendix C provides all pages used from the "TBLL Calc-Humacao.xlsm" spreadsheet.

5.2 Removal Efficiency

The Humacao RWWTP requires calculating two removal factors: one for the sludge removal during primary clarification and one for the overall plant removal. Removal factors for each pollutant are automatically calculated in the "TBLL Calc-Humacao.xlsm" spreadsheet. Each day's data points for influent, primary effluent, final effluent, and (for days available) sludge are entered as separate sample set "pairs" in the "TBLL Calc-Humacao.xlsm" spreadsheet on the Sample Data Page. Some data entered in the portion of the "TBLL Calc-Humacao.xlsm" spreadsheet section that calculates removal efficiencies are near the MDL, which reduces the accuracy of the calculated value. The reasonableness of each removal factor must be considered; therefore, the resulting values were compared to the *Local Limit Development Guidance* (EPA 2004) values shown in Tables 5-1 and 5-2 as a cross-check.

Table 5-1. Pollutant Percent Removal Efficiencies (%) Through Primary Clarification

Pollutant	Median	Generated by "TBLL Calc-Humacao.xlsm"	Adopted Removal Factor
Arsenic	NP	19.45	19.45
Cadmium	15	65.52	65.52
Chromium, Total	27	42.15	42.15
Copper	22	43.36	43.36
Cyanide	27	Cannot Calculate	27
Lead	57	63.93	63.93
Mercury	10	Cannot Calculate	10
Molybdenum	NP	29.68	29.68
Nickel	14	18.84	18.84
Selenium	NP	42.22	42.22

[5] The spreadsheet file is available on CD upon request.

Table 5-1. Pollutant Percent Removal Efficiencies (%) Through Primary Clarification

Pollutant	Median	Generated by "TBLL Calc-Humacao.xlsm"	Adopted Removal Factor
Silver	20	64.99	64.99
Zinc	27	45.28	45.28

NP = Book value not published or available

Table 5-2. Pollutant Percent Removal Efficiencies (%) Through Trickling Filter Treatment

Pollutant	Second Decile	Median	Eight Decile	Generated by "TBLL Calc-Humacao.xlsm"	Adopted Removal Factor
Arsenic	NP	NP	NP	21.07	21.07
Cadmium	33	68	93	77.49	77.49
Chromium, Total	34	55	71	57.76	57.76
Copper	32	61	89	76.28	76.28
Cyanide	33	59	79	Cannot Calculate	59
Lead	25	55	70	86.37	86.37
Mercury	33	50	62	87.17	87.17
Molybdenum	NP	NP	NP	35.71	35.71
Nickel	11	29	57	26.65	26.65
Selenium	NP	NP	NP	54.62	54.62
Silver	38	66	86	87.74	87.74
Zinc	34	67	81	76.79	76.79

The QA/QC documentation is reviewed in calculating removal factors. The data pairs are then input into the "TBLL Calc-Humacao.xlsm" spreadsheet, which calculates a removal factor for each data pair. When a data pair contains at least one non-detect, or when the effluent is greater than the influent, the spreadsheet indicates that a removal factor cannot be calculated. The data pairs for which a removal factor can be calculated are then averaged for the final removal factor used in later calculations. The average values of the individual data pair removal factors are shown in line 5 of the Sample Data Page 1 of Appendix C.

5.3 Calculation of Allowable Headworks Loadings

Using the adopted removal factors, the standard methodology from EPA's *Local Limits Development Guidance* (EPA 2004) is used to calculate the highest quantity of each pollutant that can be received at the headworks to the treatment plant and still comply with the applicable criteria. Each criterion is explained in the following subsections in relation to water quality and sludge quality requirements.

5.3.1 Water Quality Criteria

To protect receiving stream water quality, Rule 1301.1(J)(1) of the Puerto Rico Water Quality Standards Regulation (PRWQSR) sets metals limits for marine discharges. These values were placed in line 16 of the Local Limits Calc Page 1 of Appendix C (note that for metals with NPDES limits more stringent than shown in Appendix D, the NPDES permit limit has been placed in line 16, as discussed in the next section). Line 16 typically is used to enter federal human health criteria; however, a comparison showed that in every case, the PRWQSR criteria were more stringent. Consequently, federal water quality criteria for human health have also been met.

In addition to the PRWQSR, the federal water quality limits are automatically calculated in the file "TBLL Calc-Humacao.xlsm" on the publicly owned treatment works (POTW) limits page (which also uses hardness in a natural log function). Federal values are then automatically transferred in the spreadsheet to the acute and chronic criteria, which appear in lines 14 and 15 of the Local Limits Calc Page 1 of Appendix C. Once Water Quality Criteria are calculated, the AHLs based on water quality are calculated as follows:

$$L_{wq} = \frac{(8.34)(C_{wq})(Q_{potw})}{(1-R_{potw})}$$

where:

L_{wq} = Maximum allowable headworks loading (lb/d) based on water quality criteria

C_{wq} = Chronic or acute criteria

Q_{potw} = POTW average flow (mgd)

R_{potw} = POTW removal efficiency (as a decimal)

5.3.2 NPDES Criteria

NPDES permit limits for metals are typically developed based on water quality criteria and follow the same equation provided in the water quality section, except that the C_{wq} is replaced by the NPDES permit limit, and a dilution factor is not allowed. Table 5-3 lists the pollutants with NPDES limits for the Humacao RWWTP.

Table 5-3. Humacao RWWTP NPDES Limits

Pollutant	Limit (µg/L)
Copper	159.6
Cyanide (Free)	62.6
Mercury	0.116

µg/L = microgram(s) per liter

The NPDES permit limits for all pollutants in Table 5-3 were equal to or more stringent than the calculated Puerto Rico Water Quality Standards (PRWQS) criteria. The limits in Table 5-3, therefore, were manually

entered in replacement of the PRWQS criteria in line 16 of the Local Limits Calc Page 1 of the "TBLL Calc-Humacao.xlsm" spreadsheet (Appendix C).

Once the NPDES limits are entered, the AHLs are calculated as follows:

$$L_{wq} = \frac{(8.34)(C_{npdes})(Q_{potw})}{(1-R_{potw})}$$

where:

L_{wq} = Maximum allowable headworks loading based on NPDES limit (lb/d)

C_{npdes} = NPDES limit

Q_{potw} = POTW average flow (mgd)

R_{potw} = POTW removal efficiency (as a decimal)

5.3.3 Sludge Quality

Treatment plants are required to prohibit nondomestic discharges in amounts that violate applicable sludge disposal or use regulations or restrict the plant from using its chosen sludge disposal option. Currently, the sludge from the Humacao RWWTP is landfilled and must pass Toxicity Characteristic Leaching Procedure (TCLP) requirements. Humacao RWWTP sludge quality compliance monitoring shows that the metals are compliant and do not show a tendency to leach. All TCLP data were very low compared to TCLP limits and mostly non-detect for the period December 2014 to December 2021 for all pollutants, except for several metals for which the results that were less than 1 percent of the TCLP limit. Appendix E presents the testing data along with the TCLP limits.

An alternative approach focuses on total metals in the sludge. This approach compares sludge quality to Table 3 of Title 40 of the Code of Federal Regulations Part 503.13 (40 CFR 503.13), which specifies pollutant concentrations as total metals. The following equation is used to calculate AHLs based on Table 3 criteria. Table 3 is replicated in line 19 of the Local Limits Calc Page 1 in Appendix C and is used to calculate local limits based on sludge disposal.

$$L_{in} = \frac{(8.34)(C_{slcrit})(PS/100)(Q_{sldg})}{R_{potw}}$$

where:

L_{in} = Maximum allowable headworks loading based on sludge criteria (lb/d)

PS = Percent solids in the sludge to disposal (%)

Q_{sldg} = Sludge flow to disposal (mgd)

C_{slcrit} = Limiting sludge criteria (milligrams per kilogram [mg/kg])

R_{potw} = POTW removal efficiency (as a decimal)

The data associated with sludge testing are one of the most reliable sources when considering local limits for conservative pollutants, such as metals. Sludge accumulation and treatment concentrates incoming pollutants and averages the pollutants received by the plant over time. Consequently, these data often provide the best estimate of the long-term average pollutant levels in the collection system. The results for the Humacao RWWTP sludge sampled during the period of local limits testing, however, is a small fraction of the Biosolids Class A (Table 3) limits, which is another indicator that these pollutants are present in low levels throughout the entire waste collection system.

5.3.4 Impact on Wastewater Treatment Plant

Treatment plants must protect against nondomestic discharges that inhibit the treatment processes or operations. Local limits are based on known or estimated inhibitory concentrations of toxic pollutants that may be received in the treatment process. These inhibitory concentration levels are taken from reference data available in the *Local Limits Development Guidance* (EPA 2004). For the Humacao RWWTP, calculation of inhibitory AHLs must be conducted for secondary treatment inhibition (activated sludge). Activated-waste inhibition levels are found in line 17 of the Local Limits Calc Page 1 in Appendix C and are used to calculate local limits in line 69 of the Local Limits Calc Page 2. The following equation is used to calculate inhibitory AHLs.

Secondary Treatment Inhibition:

$$L_{inhib2} = \frac{(8.34)(C_{crit})(Q_{potw})}{(1-R_{prim})}$$

where:

L_{inhib2} = Maximum allowable headworks loading based on inhibition of secondary process (lb/d)

C_{crit} = Inhibition level (milligrams per liter [mg/L])

R_{prim} = Primary removal efficiency (decimal); because primary removal is not available, the denominator in the equation is 1

Q_{potw} = POTW average flow

5.4 Limit Selection

The "TBLL Calc-Humacao.xlsm" spreadsheet automates the calculation of limits so that a limit is generated for each criterion. Table 5-4 displays the MAHL[6] selection process, followed by calculation of the MAIL as mass loadings. This format facilitates verification that the smallest AHL has been selected.

Table 5-4 presents the AHLs calculated in pounds for each limiting criterion considered. The smallest of the AHLs is referred to as the MAHL because it is the highest loading that may be seen at the headworks for which all criteria will be met.

[6] The MAHL is shown in line 63 of the Local Limits Calc Page 2 of Appendix C, but the spreadsheet calculates a concentration limit for each AHL and selects the smallest value.

Table 5-4 also presents the current domestic loading. This domestic loading is subtracted from the MAHL, along with a safety factor (10 percent of the MAHL), to calculate the MAIL. The mass remaining is used, along with known industrial discharges, to calculate the maximum concentrations that can be discharged.

Table 5-4. Selection Table Using AHL, MAHL, and MAIL

Pollutant	AHL Federal Water Quality Criteria Acute [WQC-A] (lb/d)	AHL PRWQSR Water Quality Criteria Chronic [WQC-C] (lb/d)	AHL NPDES Water Quality Limits [NPDES] (lb/d)	Activated Sludge Inhibition (lb/d)	AHL Sludge Based on Table 3 40 CFR 50 [SD] (lb/d)	Domestic Loading (lb/d)	MAIL[a] (lb/d)	Basis
Arsenic	238.241	124.299	124.299	4.028	3.41	0.02	3.055	SD
Cadmium	552.339	121.795	96.246	94.094	1.061	0.002	0.953	SD
Chromium	70970	322.595	NA	560.821	NA	0.023	290.310	WQC-C
Copper	50.247	50.247	21.829	57.281	52.811	0.626	19.020	NPDES
Cyanide	6.647	NA	4.906	4.444	NA	0.202	2.767	Inhibition
Lead	4,393.823	169.866	1,703.399	89.951	9.375	0.021	8.416	Inhibition
Mercury	49.985	6.248	0.029	3.605	0.637	0.0005	0.026	NPDES
Molybdenum	NA	NA	NA	NA	1.792	0.025	1.588	SD
Nickel	277.727	30.775	NA	39.973	15.109	0.042	13.556	WQC-C
Selenium	NA	NA	NA	NA	1.734	0.007	1.553	SD
Silver	49.671	NA	49.775	23.166	NA	0.005	6.484	Inhibition
Zinc	1,116.888	1,005.199	NA	17.786	87.237	2.249	13.758	Inhibition

[a] The MAIL in this column has had 10 percent of the MAHL subtracted.

Notes:

All results in Table 5-4 are in pounds per day

NA = Not Applicable
SD = Sludge Disposal
WQC-A = Federal Acute Water Quality Standard
WQC-C = Federal Chronic Water Quality Standard

5.5 Uniform Allocation to Permitted Industrial Users

Local limits developed for this document are based on uniform allocation of available pollutant loading applied to permitted industrial users. In this method, the mass of a regulated pollutant is distributed equally to industrial flows, and each industry receives the same concentration-based limits. Derivation of uniform limits is driven by inputs for industrial flow in line 13 of the Basic Data Page 1 of Appendix C and the MAIL in line 65 on the Local Limits Calc Page 2 of Appendix C. Table 5-5 presents the selected limits found in line 69 of the Local Limits Calc Page 2 of Appendix C. The resulting limits in Table 5-5 are compared to the Puerto Rico general limits and the previous Humacao RWWTP local limits.

Table 5-5. Comparison of Previous Local Limits with New Limits

Parameter	Puerto Rico General Limits[a]	Previous Humacao RWWTP Limits Adopted 1999	Current Calculated Technically Based Limit and Proposed Limit
Arsenic	No Limit	0.057 mg/L	0.299 mg/L
Cadmium	0.1 mg/L	0.1 mg/L	0.093 mg/L
Chromium, Total	1.0 mg/L	0.3 mg/L	28.409 mg/L
Copper	1.0 mg/L	1.0 mg/L	1.861 mg/L
Cyanide	0.1 mg/L	0.1 mg/L	0.271 mg/L
Lead	0.2 mg/L	0.2 mg/L	0.824 mg/L
Mercury	0.05 mg/L	0.011 mg/L	0.003 mg/L
Molybdenum	No Limit	No Limit	0.155 mg/L
Nickel	0.5 mg/L	0.5 mg/L	1.327 mg/L
Selenium	0.2 mg/L	No Limit	0.152 mg/L
Silver	0.05 mg/L	0.05 mg/L	0.635 mg/L
Zinc	0.5 mg/L	0.5 mg/L	1.346 mg/L
Flow	No Limit	No Limit	No Limit Needed
BOD_5	No Limit	250 mg/L[c]	250 mg/L[c]
TSS	No Limit	250 mg/L[c]	250 mg/L[c]
pH	5.0 to 10.0 SU	6.5 to 9.0 SU	6.5 to 9.0 SU
Total Nitrogen	No Limit	No Limit	40 mg/L
Phenols[b]	1.0 mg/L 1.0 mg/L	0.5 mg/L	1.0 mg/L6-4
FOG	50 mg/L Total FOG	50 mg/L Total FOG	50 mg/L Total FOG
Temperature	60°C (140°F)	40°C	40°C (104°F) at the POTW 60°C (140°F) at discharge point
Flammability	No Limit	Specified as flashpoint <140 (°F)	Specified as no material with a closed cup flashpoint <140 (°F) And No two consecutive readings at ≥5% LEL, and no reading of ≥10% LEL allowed

Table 5-5. Comparison of Previous Local Limits with New Limits

Parameter	Puerto Rico General Limits[a]	Previous Humacao RWWTP Limits Adopted 1999	Current Calculated Technically Based Limit and Proposed Limit

[a] PRASA *Rules and Regulations for the Supply of Water and Sewer Services,* Section 2.05 (June 2003)
[b] Total phenols minus unsubstituted phenol [c] Concentrations are set as standards for surcharges. PRASA reserves the right to base increased surcharges on concentrations above normal domestic waste strength, which is set at 250 mg/L for BOD_5 and 250 mg/L for TSS. Surcharges up to 250 mg/L may be subject to the most current calculated cost of treatment per pound of BOD and TSS. High-strength waste above 250 mg/L may be subject to increased rates in accordance with accelerated need to improve or provide additional infrastructure to meet regulatory requirements for discharge.
°C = degree(s) Celsius
°F = degree(s) Fahrenheit
LEL = lower explosive limit
SU = standard unit(s)

6. Other Limits and Concerns

In keeping with EPA recommendations, the need for local limits for flow, BOD_5, TSS, pH, and FOG was also evaluated. Worker health and safety limits for temperature, flammability, and toxicity were also considered. Table 6-1 summarizes resultant local limits for this second group of parameters. A discussion of all evaluated pollutants/groups of compounds follows in this section.

Table 6-1. Local Limits for Other Parameters

Pollutant	Minimum Limit	Maximum Limit
Temperature	NA	40°C (104°F) at the POTW 60°C (140°F) at discharge point
Flammability	NA	Specified as no material with a closed cup flashpoint <140 (°F) and No two consecutive readings at ≥5% LEL, and no reading of ≥10% LEL allowed
pH	6.5 SU	9.0 SU
Phenols[a]	1.0 mg/L	General Limit (refer to Section 6.5)
Total Nitrogen	NA	40 mg/L
FOG	NA	50 mg/L Total FOG

[a] Total phenols minus unsubstituted phenol

6.1 Flow

The Humacao RWWTP is designed to treat a daily maximum flow of 13.38 mgd and a monthly average flow of 8.24 mgd. The plant currently receives a daily flow of 3.89 mgd. Consequently, the Humacao RWWTP currently has additional capacity available for industrial use and a local limit is not needed. It is recommended, however, that if an industry is found representing a high percentage of the total flow that industry-specific limits be established. The limits should be based on a case-by-case technical review of the industry's actual needs, as demonstrated by historical monitoring records and a review of the industry's best management practices (BMPs). This approach should be considered for all existing and new industry.

6.2 BOD_5 and TSS

Using the estimated as-built design capacity of 16,102 lb/d for BOD_5 and 21,392 lb/d for TSS in Section 3.1, the Humacao RWWTP apparently has excess capacity for both pollutants. Average monthly influent BOD_5 from January 1, 2017, to February 1, 2022, was calculated at 4,681 lb/d; for TSS during the same period, the loading was 6,219 lb/d.

Local limits for BOD_5 and TSS are not adopted because establishing such limits using the uniform allocation method implies that discharges may not be accepted above such a limit, even if capacity is available. Because of economic incentives, when adequate capacity is available, surcharges are a better way to control these POCs. When industrial discharges contain BOD_5 and TSS concentrations that are not greater than 250 mg/L, a surcharge system that charges the actual cost per pound of BOD_5 and TSS as the

actual cost for treatment provides for industry to pay an equitable share of the cost of treatment. When industrial waste exceeds 250 mg/L for either parameter, a higher surcharge is warranted due to contributions that accelerate the need to increase treatment plant capacity. PRASA reserves the right to establish and levy surcharges that account for the cost of treatment for industrial waste.

PRASA will consider, and reserves the right to use, industry-permit-specific technically based limits whenever an industry is found to have significant potential to discharge waste with BOD or TSS in significant quantities. Industry-specific limits help to reduce unnecessary loadings to the RWWTP and extend the time periods between costly facility upgrades to meet NPDES permit limits and requirements. Establishment of industry-specific limits should be based on the factors of available capacity at the RWWTP, technically achievable limits using industry-supplied pretreatment, and industrial BMPs.

6.3 Total Nitrogen

TN is defined by the PRWQSR as the sum of TKN plus NO_3 plus NO_2. TKN is the sum of nitrogen from protein plus ammonia. The NPDES permit limits TN to 5,000 µg/L at the edge of the mixing zone and to 45,000 µg/L at the point of discharge. The mixing zone study demonstrates a dilution ratio of 575:1, which is far greater than the permitted ratio of 84:1 that results in a limit of 420,000 µg/L at the point of discharge. However, the NPDES limit of 45,000 µg/L is accepted as the limiting factor for local limits in this analysis. The Humacao RWWTP is not designed to remove nitrogen. However, TN is ubiquitous to both industrial, commercial, and residential discharges to the system, and nitrogen control cannot be achieved through the use of local limits. According to *Wastewater Engineering Treatment and Reuse* (Metcalf & Eddy 2003), typical domestic waste contains a medium level of 40 mg/L of TN. Consequently, a local limit set to medium domestic strength of 40 mg/L is set in this document. This limit is considered adequate due to compliance monitoring data that show compliance from testing dating back to January 2019, when monitoring began. Results of this monitoring show that all values are well below the 5,000 µg/L required at the edge of the mixing zone.

6.4 pH

The local limits for pH currently used at the Humacao RWWTP are more stringent than the Puerto Rico Pretreatment Limits,[7] which protect the wastewater treatment system. Therefore, the local limits of 6.5 to 9.0 SU are retained.

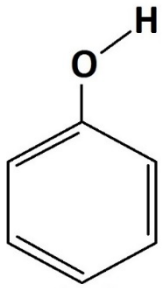
6.5 Phenols

The PRWQSR regulates phenol and a subset of phenolic derivatives. Appendix F lists these compounds and their limits. The phenol molecule consists of a 6-carbon ring, with an hydroxyl (OH) group bonded (substituted) at one of the carbons. This substance is significantly less toxic than other phenolic compounds and is even the active ingredient in some throat sprays. The PRWQSR limits phenol at 860 mg/L for marine discharges. Derivatives of phenol occur when another substance (such as a halogen) is bonded (substituted) at one of the carbons in the ring. As more chlorine (or other halogen) substitution occurs, the toxicity of the resulting compounds becomes increasingly higher.

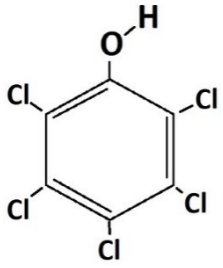
[7] Pretreatment limits are set island-wide (referred to herein as the "general limits") for metals at all wastewater treatment plants in Puerto Rico, as specified in the *Rules and Regulations for the Supply of Water and Sewer Service*.

As an example, pentachlorophenol is formed when each of the open points in the ring is attached to a chlorine. Pentachlorophenol has all available points substituted and is limited by the PRWQSR to 1 µg/L.

A reference value for unsubstituted phenol is available for both domestic concentration (0.025 µg/L) and for a removal factor (median value of 90 percent) across activated sludge treatment. Based on these references, a local limit could significantly exceed 90 mg/L. Reference data for the more toxic forms of substituted phenols, however, are not available. Consequently, it is not possible to develop a local limit for each compound in Appendix F based on reference data.



Phenol



Pentachlorophenol

Currently, the general limit in the PRASA *Rules and Regulations for the Supply of Water and Sewer Services,* Section 2.05, contains a limit of 1.0 mg/L for phenolic compounds. This limit is applied to the sum of the individual concentrations of toxic phenolic substances on the list of priority pollutants, analyzed using procedures in accordance with 40 CFR 136, Table 1C. This limit is retained, with the modification that the limit applies to phenolic compounds excluding unsubstituted phenol.

6.6 Fats, Oils, and Grease

A local limit of 50 mg/L for FOG was established in the prior Humacao RWWTP local limits. This local limit is retained.

6.7 Temperature

Prior to this TBLL evaluation, local limits for temperature were established in the Puerto Rico Pretreatment Limits[8] at 60°C (140°F). A 104°F (40°C) limit at the headworks of the sewage treatment plant is a specific requirement of the federal pretreatment regulations (40 CFR 403.5(b)(5)).

A 60°C (140°F) limit at the point of discharge into the Humacao RWWTP sanitary sewer system also has been adopted as a limit to protect collections system workers and pretreatment staff. This is adopted based on the potential for inflicting burns as published by the U.S. Consumer Product Safety Commission Publication (refer to Appendix G). This document indicates that workers exposed to 60°C for 6 seconds will experience third-degree burns.

6.8 Flammability

Local Limits for flammability were previously adopted prohibiting any discharge with a closed-cup flashpoint less than 140°F (60°C). This is a federal requirement found in 40 CFR 403. The previous limit is retained.

An additional LEL Local Limit is added in this evaluation that prohibits two successive readings of an LEL meter in the headspace of the collection system below an industry's discharge into the sanitary sewer that exceed 5 percent, with no single LEL meter reading of 10 percent or greater. The closed-cup flashpoint limit is based on federal pretreatment regulations (40 CFR 403.5 (b)(1)). The LEL limits are established based on worker/community health and safety and are much easier to monitor in the system and consequently enforce than the closed-cup flashpoint limit. The current flammability limit is retained.

[8] *Ibid.*

6.9 Toxic Organic Pollutants

Priority pollutant scans did not identify toxic organic POCs in this system. Therefore, system-wide local limits were not developed for toxic organic pollutants. PRASA will address toxic organic pollutants using industry-permit-specific technically based limits whenever a toxic compound is identified in an industrial discharge. Development of such a limit is similar to development of TBLLs as applied from the waste discharge from the industry to the effluent discharge from the Humacao RWWTP. Establishment of limits will be based on use of permissible-exposure limits, time-weighted averages, any additional information from toxicological references (such as the American Conference of Governmental Industrial Hygienists [ACGIH]), and as appropriate, Henry's constant.

7. Implementation of Local Limits

The new local limits will apply to all non-domestic users. It is the intent of this document that only users that have been issued industrial wastewater discharge permits, such as SIUs and other users with a potential to discharge pollutants for which local limits have been developed, will be required to routinely monitor for compliance with local limits.

8. References

OECD SIDS. 2005. Linear Alkylbenzene Sulfonate (LAS), 20th SIAM, Paris, France, 19–21 April 2005, Sponsor Country USA. US EPA main reviewer. UNEP Publications. http://www.chem.unep.ch/irptc/sids/OECDSIDS/LAS.pdf

Scott, Matthew J. and Malcom N. Jones. 2000. "The biodegradation of surfactants in the environment." School of Biological Sciences, University of Manchester, Oxford Road, Manchester M13 9PT, UK. August. Elsevier Science B.V. http://www.sciencedirect.com/science/article/pii/S0304415700000137

Metcalf & Eddy. 2003. *Wastewater Engineering: Treatment and Reuse*. McGraw Hill Inc., New York.

Terzic, D. Hršak, and M. Ahel. 1992. "Primary biodegradation kinetics of linear alkylbenzene sulphonates in estuarine waters." *Water Res.* 26 (1992) 585–591. http://www.sciencedirect.com/science/article/pii/004313549290231R

U.S. Environmental Protection Agency Office of Water Enforcement and Permits. 1987. *Guidance Manual on the Development and Implementation of Local Discharge Limitations under the Pretreatment Program*. EPA 833-B-87-202. December.

U.S. Environmental Protection Agency. 1994. *Water Quality Standards Handbook: Second Edition*. Office of Water. EPA-823-B-12-002. August.

U.S. Environmental Protection Agency. 2004. *Local Limits Development Guidance*. Office of Wastewater Management. EPA 833-R-04-002A. July.

Appendix A
Priority Pollutants Detected At or Above MDL

List of Priority Pollutants found at or above MDL

One Scan Each Humacao, Puerto Rico Influent & Effluent

For All reports organic compounds are not listed if results were at or below MDL

Sample ID	Method	Number of Results Above MDL		Result Influent 1.2.22 µg/l	Result Effluent 1.3.22 µg/l	MDL
624	Volatile Organic Compounds (GC/MS)	1	Bromochloromethane		0.78	0.20
		2	Chloroform	3.2	4.2	0.07
		1	1,3-Dichlorobenzene	0.96		0.06
		1	1,4-Dichlorobenzene	0.96		0.09
		1	Chlorobenzene	0.06		0.05
		1	Methylene Chloride	0.73		0.30
		1	Toluene	1.0		0.07
625	Semivolatile Organic Compounds	2	bis(2-Ethylhexyl)phthalate	3.2	0.82	0.13
		1	Butyl Benzyl Phthalate		0.17	0.0210
		2	Di-n-butyl Phthalate	0.43	0.1	0.0230
		2	Diethyl Phthalate	0.97	0.085	0.0150
		1	Dimethyl Phthalate	0.051		0.0210
		1	2,4,6-Trichlorophenol		0.072	0.0580
625.1	PAH by Low Level Semi Volatile	2	Anthracene	0.018	0.0017	0.0017
		2	Benzo(a)anthracene	0.0095	0.0032	0.0020
		1	Chrysene	0.0044		0.0016
		2	Fluoranthene	0.010	0.0024	0.0024
		2	Fluorene	0.012	0.0038	0.0038
		2	Naphthalene	0.067	0.0026	0.0026
		2	Phenanthrene	0.025	0.0095	0.0022
		1	Pyrene		0.0032	0.0010
		1	Phenol	0.66		0.0630
622	Organophosphorous Pesticides	0				
608	Organochlorine Pesticides	0				
608.3	Organochlorine Pesticides	1	beta-BHC		0.0099	0.0034
612	Organochlorine Pesticides	0				
617	Organochlorine Pesticides	0				
632	Solvent Extractable Nonvolatile Compounds	2	Carbaryl	0.14	0.096	0.039
1668C	PCB	2		870	353	23
1613B	Tetra Chlorinated Dioxins & Furans ID by HRGC/HRMS	0				

J - The result is an estimated value

Appendix B
Guidance on the Selection of Pollutants of Concern

Guidance on the Selection of Pollutants of Concern

Guidance Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Program, EPA 833-B-87-202, December 1987

Also, EPA guidance directs that a toxic pollutant may be classified as a POC if it meets the following screening criteria:

- *The maximum concentration of the pollutant in a grab sample from the POTW's influent is more than half the inhibition threshold for the biological process; or the maximum concentration of the pollutant in a 24-hour composite sample from the POTWs influent is more than one-fourth of the inhibition threshold for the biological process.*
- *The maximum concentration of the pollutant in the POTW's influent is more than 1/500* of the applicable sludge criteria.*
- *The maximum concentration of the pollutant in the POTW's influent is more than the maximum allowable effluent concentration.*
- *The maximum concentration of the pollutant in the POTW's effluent is more than one half the allowable effluent concentration.*
- *The maximum concentration of the pollutant in the POTW's sludge is more than one half of the allowable sludge concentration.*

The maximum measured concentration of the pollutant was greater than the ACGIH screening level for fume toxicity.

Appendix C
Data Sheets Used in
“TBLL Calc-Humacao.xlsm”

Line Number

Basic Data

1	Name of Facility:	HUMACAO	
2	Point of Contact:	Luis Abreu	
3	Person Entering Data:	Dara Osborne	
4	Reviewer:	Wayne Heinemann	
5	**GENERAL INFORMATION:**	(Data in colored cells below required)	
6	Receiving Water Hardness (if fresh)		<----- Number must be between 25 and 400
7	(M)arine, (F)resh, or (B)oth Discharges	**M**	<----- Enter only letters "M", "F", or "B"
8	Sludge: Class A (A) or (C)eiling level	**C**	<----- Enter only letters "A" or "C"
9	Plant: (A)ctivated sludge or (O)ther	**A**	<----- Enter only letters "A" or "O"
10			
11	Total Plant Flow (in MGD)	**3.89 MGD**	<----- For flows typically the most critical situation (one that
12	Domestic Flow (in MGD)	**2.6647 MGD**	yields the lowest local limits) is the lowest flow month, but run
13	Industrial Flow (in MGD)	**1.2253 MGD**	several scenarios if there is any doubt. Adopt the lowest limits.
14	Infiltration/Inflow (by subtraction)		
15	Acute Dilution Factor	**84. : 1**	<----- Based on 1Q10+avg plnt flow
16	Chronic Dilution Factor	**84. : 1**	<----- Based on 7Q10 + avg plnt flow
17	Dilution Factor for __Health___	84. : 1	<----- Enter Chronic DF if not otherwise determined
18	Digester Flow (in MGD)	**0.0584 MGD**	<----- recommend: 0.05835 MGD @ 2% solids
19	Dry Sludge Production Rate (US Tons/day)	**4.8664 T/D**	<----- recommend: 4.86639 T/D
20			
21	**Default Method for Calculating Limits**	**Customize as needed for specific pollutants at "LOCLIMIT.XLS" Rows 45-49**	
22	Sampling Data Available (inf, eff, sludge) (Y/N)	**Y**	<--- "Y" if sampling data available, otherwise defaults presumed
23	Credit present loading of existing sources (Y/N)	**N**	<-- reduce influent to domestic using "loclimit.xls" row 28
24	Adjust for receiving water pollution (Y/N)	**N**	<-- requires receiving water data in "loclimit.xls" row 29
25	Use Observed Overall Removal Rate (Y/N)	**N**	<-- Always say "Y" if good data available from the POTW
26	Use Observed Primary Removal Rate (Y/N)	**N**	<-- If primary effluent sample data is obtained say "Y"
27	Fraction of Loading Capacity held in reserve	**10.00%**	<-- Enter .1 for 10%, etc.

Line Number

Basic Data

1	**Which Conservative Pollutants to Limit? (Bold = Required by EPA)**	
2	**Check (or Un-Check) for Each Pollutant**	Develop Local Limit? (check for YES)
3	Antimony	☐
4	**Arsenic (T)**	☑
5	Arsenic (penta or +5)	☐
6	Beryllium	☑
7	**Cadmium**	☑
8	**Chromium(+6)**	☐
9	Chromium (T)	☑
10	**Copper**	☑
11	**Cyanide**	☑
12	**Lead**	☑
13	**Mercury**	☑
14	**Molybdenum**	☑
15	**Nickel**	☑
16	**Selenium**	☑
17	**Silver**	☑
18	Thallium	☑
19	TributylTin	☐
20	**Zinc**	☑

Local Limits Calculation Page

Line Number	Pollutant:	Arsenic(T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
2	**Part II: PLANT DATA - OPEN AND CHANGE "BASICDATA.XLS" VALUES IF FLOWS CONTRIBUTING FOR A PARTICULAR POLLUTANT VARY**												
3	Total Plant Flow (in MGD)	3.89 MGD	3.89 MGD	3.89 MGD	3.89 MGD	3.89 MGD	3.89 MGD	3.89 MGD	3.89 MGD	3.89 MGD	3.89 MGD	3.89 MGD	3.89 MGD
4	Domestic Flow (in MGD)	2.6647 MGD	2.6647 MGD	2.6647 MGD	2.6647 MGD	2.6647 MGD	2.6647 MGD	2.6647 MGD	2.6647 MGD	2.6647 MGD	2.6647 MGD	2.6647 MGD	2.6647 MGD
5	Industrial Flow (in MGD)	1.2253 MGD	1.2253 MGD	1.2253 MGD	1.2253 MGD	1.2253 MGD	1.2253 MGD	1.2253 MGD	1.2253 MGD	1.2253 MGD	1.2253 MGD	1.2253 MGD	1.2253 MGD
6	Infiltration/Inflow (by subtraction)	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD
7	Acute Dilution Factor	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1
8	Chronic Dilution Factor	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1
9	Dilution Factor for HH Limits	84. : 1	84. : 1	84. : 1	1. : 1	1. : 1	84. : 1	1. : 1	84. : 1	84. : 1	84. : 1	84. : 1	84. : 1
10	Digester Flow (in MGD)	0.0584 MGD	0.0584 MGD	0.0584 MGD	0.0584 MGD	0.0584 MGD	0.0584 MGD	0.0584 MGD	0.0584 MGD	0.0584 MGD	0.0584 MGD	0.0584 MGD	0.0584 MGD
11	Dry Sludge Production Rate (US Tons/day)	4.8664 T/D	4.8664 T/D	4.8664 T/D	4.8664 T/D	4.8664 T/D	4.8664 T/D	4.8664 T/D	4.8664 T/D	4.8664 T/D	4.8664 T/D	4.8664 T/D	4.8664 T/D
12	Nitrification	1.5	5.2	.25-1.9,1-100	.05-.48	.34-.5	0.5			.25-.5, 5			.08-.5
13	**Part III: CONCENTRATIONS LIMITING THE POTW DUE TO PASS THROUGH OR INTERFERENCE**												
14	WQ Acute criteria, aquatic life (mg/L)	0.069 mg/l	0.0456 mg/l	11. mg/l	0.0044 mg/l	0.001 mg/l	0.2198 mg/l	0.00235 mg/l	NA	0.07 mg/l	NA	0.0022 mg/l	0.0951 mg/l
15	WQ Chronic criteria, aquatic life (mg/L)	0.04 mg/l	0.0101 mg/l	0.05 mg/l	0.0044 mg/l	NA	0.0085 mg/l	0.00029 mg/l	NA	0.0083 mg/l	NA	NA	0.0856 mg/l
16	Other Water Criteria-Color Code at Input	0.036 mg/L	0.008 mg/L	NA	0.160 mg/L	0.062 mg/l	0.085 mg/l	0.00012 mg/l	NA	0.008 mg/l	0.071 mg/l	0.002 mg/l	0.086 mg/l
17	Activated Sludge Inhibition Level	0.1 mg/l	1. mg/l	10. mg/l	1. mg/l	0.1 mg/l	1. mg/l	0.1 mg/l	NA	1. mg/l	NA	0.25 mg/l	0.3 mg/l
18	Anaerobic Digestor Inhibition Level	1.6 mg/l	20. mg/l	NA	40. mg/l	4. mg/l	340. mg/l	NA	NA	10. mg/l	NA	13. mg/l	400. mg/l
19	Class A Sludge standards (40 CFR 503)	41. mg/l	39. mg/l	NA	1,500. mg/l	NA	300. mg/l	17. mg/l	75. mg/l	420. mg/l	100. mg/l	NA	2,800. mg/l
20	Sludge ceiling concentration for beneficial use	75. mg/l	85. mg/l	NA	4,300. mg/l	NA	840. mg/l	57. mg/l	75. mg/l	420. mg/l	100. mg/l	NA	7,500. mg/l
21		Other Water Criteria	Values in gray are NPDES Limits		Values in Blue are WQ Chronic criteria, human Health				PRWQS				
22	**Part IV: POLLUTANT CONCENTRATION ----- SUMMARY**												
23	Estimated Average Industrial Conc.	0.009 mg/l	0. mg/l	0.012 mg/l	0.164 mg/l	0.011 mg/l	0.005 mg/l	0. mg/l	0.005 mg/l	0.011 mg/l	0.001 mg/l	0.001 mg/l	0.298 mg/l
24	Ambient Concentration (receiving water)	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L
25	Adjusted Domestic concentration	0.0007 mg/l	0.00008 mg/l	0.00104 mg/l	0.02818 mg/l	0.00911 mg/l	0.00095 mg/l	0.00002 mg/l	0.00111 mg/l	0.0019 mg/l	0.00033 mg/l	0.00024 mg/l	0.1012 mg/l
26	Typical Domestic Concentrations	0.003 mg/l	0.003 mg/l	0.05 mg/l	0.061 mg/l	0.041 mg/l	0.049 mg/l	0.0003 mg/l	0.01 mg/l	0.021 mg/l	0.001 mg/l	0.005 mg/l	0.175 mg/l
27	Average Sludge Level (mg/Kg - Dry)	7.283 mg/kg	1.293 mg/kg	45.2 mg/kg	594.25 mg/kg	NA	28.025 mg/kg	0.002 mg/kg	9.485 mg/kg	20.375 mg/kg	6.24 mg/kg	6.173 mg/kg	1,517.5 mg/kg
28	Average Influent Level (mg/l)	0.0033 mg/l	0.0001 mg/l	0.0046 mg/l	0.0708 mg/l	0.0098 mg/l	0.0024 mg/l	0.0001 mg/l	0.0025 mg/l	0.0047 mg/l	0.0006 mg/l	0.0005 mg/l	0.1631 mg/l
29	Average Effluent Level (mg/l)	0.0025 mg/l	0. mg/l	0.0016 mg/l	0.0139 mg/l	0.0206 mg/l	0.0002 mg/l	0. mg/l	0.0015 mg/l	0.0033 mg/l	0.0002 mg/l	0.0001 mg/l	0.0297 mg/l
30													

Local Limits Calculation Page

Line Number													
31	**Part V: REMOVAL RATES**												
32	Average Primary Removal Rate	19.45%	65.52%	42.15%	43.36%	27.00%	63.93%	10.00%	29.68%	18.84%	42.22%	64.99%	45.28%
33	Average Overall Removal Rate	21.07%	77.49%	57.76%	76.28%	59.00%	86.37%	87.17%	35.71%	26.65%	54.62%	87.74%	76.79%
34	Reference Primary Removal Rate	19.45%	65.52%	42.15%	43.36%	27.00%	63.93%	10.00%	29.68%	18.84%	42.22%	64.99%	45.28%
35	Reference 2d Decile Plant Removal	31.00%	33.00%	68.00%	67.00%	41.00%	39.00%	50.00%		25.00%	33.00%	50.00%	64.00%
36	Reference Ave Plant Removal	21.07%	77.49%	57.76%	76.28%	59.00%	86.37%	87.17%	35.71%	26.65%	54.62%	87.74%	76.79%
37	Reference 8th Decile Removal	53.00%	91.00%	91.00%	95.00%	84.00%	76.00%	79.00%		62.00%	67.00%	88.00%	88.00%
38													
39	**Part VI: HOW TO CALCULATE LIMITS:**												
40	Sampling Data Available (inf, eff, sludge) (Y/N)	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
41	Credit present loading of existing sources (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
42	Adjust for receiving water pollution	N	N	N	N	N	N	N	N	N	N	N	N
43	Use Observed Overall Removal Rate (Y/N)	N	N	N	N	N	N	N	N	N	N	N	N
44	Use Observed Primary Removal Rate (Y/N)	N	N	N	N	N	N	N	N	N	N	N	N
45													
46	**Part VII: LOCAL LIMITS CORRESPONDING TO THE CRITERIA ABOVE BASED ON COMPLIANCE WITH:**												
47	Acute WQ Standards (in mg/l)	23.312 mg/l	54.05 mg/l	6,944.92 mg/l	4.856 mg/l	0.631 mg/l	429.964 mg/l	4.891 mg/l	NA	27.173 mg/l	NA	4.86 mg/l	109.08 mg/l
48	Chronic WQ Standards (in mg/l)	12.162 mg/l	11.918 mg/l	31.566 mg/l	4.856 mg/l	NA	16.62055 mg/l	0.61137 mg/l	NA	3.007 mg/l	NA	NA	98.15 mg/l
49	Other Water Criteria-Color Code at Input	12.162 mg/l	9.418 mg/l	NA	2.075 mg/l	0.46 mg/l	166.687 mg/l	0.003 mg/l	NA	NA	NA	4.87 mg/l	NA
50	Sludge Application Limits (in mg/l)	0.332 mg/l	0.104 mg/l	NA	5.107 mg/l	NA	0.915 mg/l	0.062 mg/l	0.173 mg/l	1.474 mg/l	0.169 mg/l	NA	8.325 mg/l
51	Activated Sludge Inhibition (in mg/l)	0.393 mg/l	9.208 mg/l	54.88 mg/l	5.544 mg/l	0.415 mg/l	8.8 mg/l	0.353 mg/l	NA	3.907 mg/l	NA	2.266 mg/l	1.52 mg/l
52	Anaerobic Digestor Inhibition (in mg/l)	0.36 mg/l	1.229 mg/l	NA	2.436 mg/l	0.3 mg/l	18.74 mg/l	NA	NA	1.782 mg/l	NA	0.705 mg/l	24.59 mg/l
53													
54	**Part VIII: SAMPLE QUALITY: COMPARISON OF LOADINGS AND REMOVAL RATES IMPLIED BY SAMPLE DATA**												
55	Pollutants in Influent (per sampling)	0.106 lbs	0.004 lbs	0.149 lbs	2.298 lbs	0.319 lbs	0.077 lbs	0.004 lbs	0.081 lbs	0.151 lbs	0.018 lbs	0.015 lbs	5.29 lbs
56	Pollutants in biosolids (per sampling)	0.071 lbs	0.013 lbs	0.44 lbs	5.784 lbs	#VALUE!	0.273 lbs	0. lbs	0.092 lbs	0.198 lbs	0.061 lbs	0.06 lbs	14.769 lbs
57	Pollutants in effluent (per sampling)	0.081 lbs	0.001 lbs	0.052 lbs	0.444 lbs	0.658 lbs	0.008 lbs	0. lbs	0.048 lbs	0.105 lbs	0.008 lbs	0.002 lbs	0.95 lbs
58	% Influent load accounted for: (eff/inf)	143.92%	328.70%	330.80%	271.00%	#VALUE!	365.80%	9.21%	174.49%	200.96%	383.86%	414.19%	297.13%
59	Current HW Load Implied by Sludge Data:	9.86%	1.53%	0.24%	34.73%	#VALUE!	3.37%	0.08%	14.43%	4.92%	6.41%	0.95%	108.14%
60	Local Limit implied by %max Biosolids level	0.048 mg/L	0.012 mg/L	NA	0.343 mg/L	NA	0.073 mg/L	3.369 mg/L	0.054 mg/L	0.290 mg/L	0.026 mg/L	NA	0.438 mg/L
61													
62	**PART IX: MASS BASED ANALYSIS**												
63	Limiting MAHL (Dom Load + LL*IUflow)	3.412 lb/d	1.06 lb/d	322.59 lb/d	21.83 lb/d	3.3 lb/d	9.37 lb/d	0.03 lb/d	1.79 lb/d	15.11 lb/d	1.73 lb/d	7.21 lb/d	17.79 lb/d
64	Domestic and 10.% reserve for safety and growth	0.3568 lb/d	0.1078 lb/d	32.2822 lb/d	2.8091 lb/d	0.5324 lb/d	0.9585 lb/d	0.0034 lb/d	0.2039 lb/d	1.5532 lb/d	0.1806 lb/d	0.7264 lb/d	4.0276 lb/d
65	Max. Allowable Industrial Loading (MAIL)	3.0552 lb/d	0.9532 lb/d	290.3096 lb/d	19.0201 lb/d	2.7669 lb/d	8.4161 lb/d	0.0259 lb/d	1.5883 lb/d	13.5557 lb/d	1.5533 lb/d	6.4842 lb/d	13.7584 lb/d
66													
67	**Part X: LOCAL LIMIT RECAP:**	**Arsenic(T)**	**Cadmium**	**Chrome (T)**	**Copper**	**Cyanide**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Zinc**
68	Industrial Flow (in MGD)	1.23 MGD	1.23 MGD	1.23 MGD	1.23 MGD	1.23 MGD	1.23 MGD	1.23 MGD	1.23 MGD	1.23 MGD	1.23 MGD	1.23 MGD	1.23 MGD
69	Local Limit = MAIL/(8.34*Industrial Flow)	0.299 mg/l	0.093 mg/l	28.409 mg/l	1.861 mg/l	0.271 mg/l	0.824 mg/l	0.003 mg/l	0.155 mg/l	1.327 mg/l	0.152 mg/l	0.635 mg/l	1.346 mg/l
70													

			Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
1	**SUMMARY DATA**													
2	Ave. Influent Conc.		3.261 ug/L	0.124 ug/L	4.582 ug/L	70.836 ug/L	9.828 ug/L	2.363 ug/L	0.131 ug/L	2.484 ug/L	4.651 ug/L	0.550 ug/L	0.462 ug/L	163.071 ug/L
3	Ave. Effluent Conc.		2.546 ug/L	0.022 ug/L	1.622 ug/L	13.900 ug/L	20.577 ug/L	0.241 ug/L	0.012 ug/L	1.511 ug/L	3.284 ug/L	0.243 ug/L	0.062 ug/L	29.729 ug/L
4	Ave. Primary Removal (ADRE)		19.45%	65.52%	42.15%	43.36%	27.00%	63.93%	10.00%	29.68%	18.84%	42.22%	64.99%	45.28%
5	Ave. Overall Removal (ADRE)		21.07%	77.49%	57.76%	76.28%	59.00%	86.37%	87.17%	35.71%	26.65%	54.62%	87.74%	76.79%
6	Effluent Variation (COV)		0.06	0.20	0.10	0.12	0.33	0.27	0.45	0.20	0.07	20.00	1.32	0.10
7	Average Sludge Conc.		7.28 mg/kg	1.29 mg/kg	45.2 mg/kg	594.25 mg/kg	#DIV/0!	28.03 mg/kg	0. mg/kg	9.49 mg/kg	20.38 mg/kg	6.24 mg/kg	6.17 mg/kg	1,517.5 mg/kg
8	Ambient Receiving Water Conc.		0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L
9	AVE Industrial Conc.		8.8 ug/L	0.2 ug/L	12.3 ug/L	163.6 ug/L	11.4 ug/L	5.4 ug/L	0.4 ug/L	5.5 ug/L	10.6 ug/L	1.0 ug/L	0.9 ug/L	297.6 ug/L
10	**SUMMARY (ABOVE)**													
11	**SAMPLE 1**													
12	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
13	1/2/2022	Influent	3.09 ug/l	0.082 ug/l	3.45 ug/l	50.6 ug/l	8.32 ug/l	1.47 ug/l	0.0545 ug/l	1.36 ug/l	4.68 ug/l	0.4 ug/l	0.208 ug/l	112. ug/l
14	1/3/2022	Effluent	2.26 ug/l	0.019 ug/l	1.52 ug/l	12.2 ug/l	18.2 ug/l	0.154 ug/l	0.0062 ug/l	1. ug/l	3.09 ug/l	0.2 ug/l	0.031 ug/l	26.3 ug/l
15		Prim._Clar.												
16		Sludge												
17		Sludge Wet												
18	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
19	Sludge	ML/RL												
20	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	**Can't Do**	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
21	Overall Removal Rate		26.86%	76.83%	55.94%	75.89%	Can't Do	89.52%	88.55%	26.47%	33.97%	50.00%	85.10%	76.52%
22														
23	**SAMPLE 2**													
24	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
25	1/3/2022	Influent	4.01 ug/l	0.249 ug/l	7.49 ug/l	144. ug/l	8.29 ug/l	4.63 ug/l	0.231 ug/l	2.76 ug/l	6.02 ug/l	0.9 ug/l	0.821 ug/l	326. ug/l
26	1/4/2022	Effluent	2.5 ug/l	0.027 ug/l	1.61 ug/l	13.2 ug/l	21.5 ug/l	0.234 ug/l	0.01 ug/l	1.58 ug/l	3.36 ug/l	0.3 ug/l	0.051 ug/l	32. ug/l
27	1/3/2022	Prim._Clar.	2.62 ug/l	0.059 ug/l	2.39 ug/l	29. ug/l	15.5 ug/l	0.69 ug/l	0.0203 ug/l	1.35 ug/l	3.26 ug/l	0.3 ug/l	0.136 ug/l	58.5 ug/l
28		Sludge												
29		Sludge Wet												
30	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
31	Sludge	ML/RL	0. ug/l	0. ug/l	0. ug/l	0. ug/l	0. ug/l	0. ug/l	0. ug/l	0. ug/l	0. ug/l	0. ug/l	0. ug/l	0. ug/l
32	Primary Removal Rate:		34.66%	76.31%	68.09%	79.86%	Can't Do	85.10%	Can't Do	51.09%	45.85%	66.67%	83.43%	82.06%
33	Overall Removal Rate		37.66%	89.16%	78.50%	90.83%	Can't Do	94.95%	95.69%	42.75%	44.19%	66.67%	93.79%	90.18%
34														
35	**SAMPLE 3**													
36	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
37	1/4/2022	Influent	4.43 ug/l	0.443 ug/l	13. ug/l	187. ug/l	15. ug/l	8.05 ug/l	0.498 ug/l	3.39 ug/l	8.06 ug/l	1.2 ug/l	1.56 ug/l	506. ug/l
38	1/5/2022	Effluent	2.55 ug/l	0.025 ug/l	1.62 ug/l	17. ug/l	19.5 ug/l	0.309 ug/l	0.0152 ug/l	1.55 ug/l	3.21 ug/l	0.2 ug/l	0.06 ug/l	36. ug/l
39		Prim._Clar.												
40	1/4/2022	Sludge	7.16 mg/kg	1.22 mg/kg	42. mg/kg	607. mg/kg		27.3 mg/kg	0.0019 mg/kg	8.68 mg/kg	19.3 mg/kg	5.84 mg/kg	4.51 mg/kg	1,490. mg/kg
41		Sludge Wet												
42	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
43	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.21 ug/l	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
44	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
45	Overall Removal Rate		42.44%	94.36%	87.54%	90.91%	Can't Do	96.16%	96.95%	54.28%	60.17%	83.33%	96.15%	92.89%
46														
47	**SAMPLE 4**													
48	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
49	1/5/2022	Influent	3.15 ug/l	0.014 ug/l	4.86 ug/l	89.7 ug/l	12. ug/l	2.17 ug/l	0.07 ug/l	2.56 ug/l	4.46 ug/l	0.5 ug/l	0.46 ug/l	156. ug/l
50	1/6/2022	Effluent	2.42 ug/l	0.02 ug/l	1.53 ug/l	13.7 ug/l	22.1 ug/l	0.203 ug/l	0.0076 ug/l	2.32 ug/l	3.14 ug/l	0.3 ug/l	0.049 ug/l	29. ug/l
51		Prim._Clar.												
52		Sludge												
53		Sludge Wet												
54	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
55	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.21 ug/l	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
56	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
57	Overall Removal Rate		23.17%	Can't Do	68.52%	84.73%	Can't Do	90.65%	89.13%	9.38%	29.60%	40.00%	89.35%	81.41%

			Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
1	**SUMMARY DATA**													
2	Ave. Influent Conc.		3.261 ug/L	0.124 ug/L	4.582 ug/L	70.836 ug/L	9.828 ug/L	2.363 ug/L	0.131 ug/L	2.484 ug/L	4.651 ug/L	0.550 ug/L	0.462 ug/L	163.071 ug/L
3	Ave. Effluent Conc.		2.546 ug/L	0.022 ug/L	1.622 ug/L	13.900 ug/L	20.577 ug/L	0.241 ug/L	0.012 ug/L	1.511 ug/L	3.284 ug/L	0.243 ug/L	0.062 ug/L	29.729 ug/L
4	Ave. Primary Removal (ADRE)		19.45%	65.52%	42.15%	43.36%	27.00%	63.93%	10.00%	29.68%	18.84%	42.22%	64.99%	45.28%
5	Ave. Overall Removal (ADRE)		21.07%	77.49%	57.76%	76.28%	59.00%	86.37%	87.17%	35.71%	26.65%	54.62%	87.74%	76.79%
6	Effluent Variation (COV)		0.06	0.20	0.10	0.12	0.33	0.27	0.45	0.20	0.07	20.00	1.32	0.10
7	Average Sludge Conc.		7.28 mg/kg	1.29 mg/kg	45.2 mg/kg	594.25 mg/kg	#DIV/0!	28.03 mg/kg	0. mg/kg	9.49 mg/kg	20.38 mg/kg	6.24 mg/kg	6.17 mg/kg	1,517.5 mg/kg
8	Ambient Receiving Water Conc.		0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L
9	AVE Industrial Conc.		8.8 ug/L	0.2 ug/L	12.3 ug/L	163.6 ug/L	11.4 ug/L	5.4 ug/L	0.4 ug/L	5.5 ug/L	10.6 ug/L	1.0 ug/L	0.9 ug/L	297.6 ug/L
10	**SUMMARY (ABOVE)**													
59	**SAMPLE 5**													
60	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
61	1/6/2022	Influent	2.83 ug/l	0.093 ug/l	3.51 ug/l	57. ug/l	14. ug/l	1.47 ug/l	0.0526 ug/l	3.54 ug/l	4.04 ug/l	0.5 ug/l	0.264 ug/l	117. ug/l
62	1/7/2022	Effluent	2.32 ug/l	0.029 ug/l	1.52 ug/l	14.1 ug/l	16.3 ug/l	0.268 ug/l	0.0091 ug/l	1.5 ug/l	2.81 ug/l	0.2 ug/l	0.048 ug/l	33.2 ug/l
63	1/6/2022	Prim._Clar.	2.71 ug/l	0.093 ug/l	3.04 ug/l	46.6 ug/l	11.4 ug/l	1.47 ug/l	0.0322 ug/l	3.39 ug/l	3.73 ug/l	0.4 ug/l	0.288 ug/l	101. ug/l
64	1/6/2022	Sludge	7.16 mg/kg	1.23 mg/kg	45.3 mg/kg	513. mg/kg		26.7 mg/kg	0.0026 mg/kg	8.59 mg/kg	20.7 mg/kg	6.22 mg/kg	4.81 mg/kg	1,510. mg/kg
65		Sludge Wet												
66	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
67	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
68	Primary Removal Rate:		4.24%	Can't Do	13.39%	18.25%	Can't Do	Can't Do	Can't Do	4.24%	7.67%	20.00%	Can't Do	13.68%
69	Overall Removal Rate		18.02%	68.82%	56.70%	75.26%	Can't Do	81.77%	82.66%	57.63%	30.45%	60.00%	81.82%	71.62%
70														
71	**SAMPLE 6**													
72	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
73	1/7/2022	Influent	2.6 ug/l	0.108 ug/l	3.87 ug/l	50. ug/l	7.34 ug/l	2.02 ug/l	0.126 ug/l	2.15 ug/l	3.98 ug/l	0.5 ug/l	0.629 ug/l	146. ug/l
74	1/8/2022	Effluent	2.46 ug/l	0.027 ug/l	1.6 ug/l	12.4 ug/l	19. ug/l	0.305 ug/l	0.0121 ug/l	1.65 ug/l	3.13 ug/l	0.3 ug/l	0.047 ug/l	31.3 ug/l
75		Prim._Clar.												
76		Sludge												
77		Sludge Wet												
78	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1..5	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
79	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
80	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
81	Overall Removal Rate		5.38%	75.00%	58.66%	75.20%	Can't Do	84.90%	90.40%	23.26%	21.36%	40.00%	92.53%	78.56%
82														
83	**SAMPLE 7**													
84	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
85	1/8/2022	Influent	3.72 ug/l	0.177 ug/l	4.42 ug/l	61.5 ug/l	7.22 ug/l	2.1 ug/l	0.0835 ug/l	3.08 ug/l	4.57 ug/l	0.6 ug/l	0.362 ug/l	160. ug/l
86	1/9/2022	Effluent	2.63 ug/l	0.019 ug/l	1.7 ug/l	12.4 ug/l	22.8 ug/l	0.236 ug/l	0.0089 ug/l	1.54 ug/l	3.42 ug/l	0.3 ug/l	0.041 ug/l	31. ug/l
87		Prim._Clar.												
88		Sludge												
89		Sludge Wet												
90	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1..5	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
91	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
92	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
93	Overall Removal Rate		29.30%	89.27%	61.54%	79.84%	Can't Do	88.76%	89.34%	50.00%	25.16%	50.00%	88.67%	80.63%
94														
95	**SAMPLE 8**													
96	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
97	1/9/2022	Influent	3.71 ug/l	0.136 ug/l	4.76 ug/l	65.3 ug/l	5.9 ug/l	2.34 ug/l	0.0643 ug/l	3.26 ug/l	4.87 ug/l	0.6 ug/l	0.485 ug/l	171. ug/l
98	1/10/2022	Effluent	2.6 ug/l	0.021 ug/l	1.67 ug/l	12.3 ug/l	7.28 ug/l	0.245 ug/l	0.0118 ug/l	1.2 ug/l	3.43 ug/l	0.2 ug/l	0.04 ug/l	28.8 ug/l
99		Prim._Clar.												
100		Sludge												
101		Sludge Wet												
102	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
103	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
104	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
105	Overall Removal Rate		29.92%	84.56%	64.92%	81.16%	Can't Do	89.53%	81.65%	63.19%	29.57%	66.67%	91.75%	83.16%

			Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
1	**SUMMARY DATA**													
2	Ave. Influent Conc.		3.261 ug/L	0.124 ug/L	4.582 ug/L	70.836 ug/L	9.828 ug/L	2.363 ug/L	0.131 ug/L	2.484 ug/L	4.651 ug/L	0.550 ug/L	0.462 ug/L	163.071 ug/L
3	Ave. Effluent Conc.		2.546 ug/L	0.022 ug/L	1.622 ug/L	13.900 ug/L	20.577 ug/L	0.241 ug/L	0.012 ug/L	1.511 ug/L	3.284 ug/L	0.243 ug/L	0.062 ug/L	29.729 ug/L
4	Ave. Primary Removal (ADRE)		19.45%	65.52%	42.15%	43.36%	27.00%	63.93%	10.00%	29.68%	18.84%	42.22%	64.99%	45.28%
5	Ave. Overall Removal (ADRE)		21.07%	77.49%	57.76%	76.28%	59.00%	86.37%	87.17%	35.71%	26.65%	54.62%	87.74%	76.79%
6	Effluent Variation (COV)		0.06	0.20	0.10	0.12	0.33	0.27	0.45	0.20	0.07	20.00	1.32	0.10
7	Average Sludge Conc.		7.28 mg/kg	1.29 mg/kg	45.2 mg/kg	594.25 mg/kg	#DIV/0!	28.03 mg/kg	0. mg/kg	9.49 mg/kg	20.38 mg/kg	6.24 mg/kg	6.17 mg/kg	1,517.5 mg/kg
8	Ambient Receiving Water Conc.		0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L
9	AVE Industrial Conc.		8.8 ug/L	0.2 ug/L	12.3 ug/L	163.6 ug/L	11.4 ug/L	5.4 ug/L	0.4 ug/L	5.5 ug/L	10.6 ug/L	1.0 ug/L	0.9 ug/L	297.6 ug/L
10	**SUMMARY (ABOVE)**													
107	**SAMPLE 9**													
108	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
109	1/10/2022	Influent	2.83 ug/l	0.081 ug/l	3.3 ug/l	48.6 ug/l	6.87 ug/l	1.65 ug/l	0.165 ug/l	1.8 ug/l	4.07 ug/l	0.4 ug/l	0.238 ug/l	119. ug/l
110	1/11/2022	Effluent	2.7 ug/l	0.019 ug/l	2.07 ug/l	16.5 ug/l	37.8 ug/l	0.395 ug/l	0.0159 ug/l	1.47 ug/l	3.26 ug/l	0.4 ug/l	0.291 ug/l	32.3 ug/l
111	1/10/2022	Prim._Clar.	2.86 ug/l	0.085 ug/l	3.75 ug/l	39.2 ug/l	6.86 ug/l	1.18 ug/l	0.0474 ug/l	1.9 ug/l	4.01 ug/l	0.5 ug/l	0.261 ug/l	93.4 ug/l
112		Sludge												
113		Sludge Wet												
114	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
115	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
116	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	19.34%	Can't Do	28.48%	Can't Do	Can't Do	1.47%	Can't Do	Can't Do	21.51%
117	Overall Removal Rate		4.59%	76.54%	37.27%	66.05%	Can't Do	76.06%	90.36%	18.33%	19.90%	Can't Do	Can't Do	72.86%
118														
119	**SAMPLE 10**													
120	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
121	1/11/2022	Influent	3.53 ug/l	0.095 ug/l	3.57 ug/l	49.5 ug/l	12.8 ug/l	1.63 ug/l	0.0773 ug/l	2.08 ug/l	4.05 ug/l	0.5 ug/l	0.357 ug/l	115. ug/l
122	1/12/2022	Effluent	2.48 ug/l	0.015 ug/l	1.35 ug/l	13.6 ug/l	19.4 ug/l	0.216 ug/l	0.0252 ug/l	1.26 ug/l	3.17 ug/l	0.2 ug/l	0.052 ug/l	29.6 ug/l
123		Prim._Clar.												
124	1/11/2022	Sludge	6.9 mg/kg	1.28 mg/kg	45.7 mg/kg	592. mg/kg		26.9 mg/kg	0.0019 mg/kg	9.77 mg/kg	19.9 mg/kg	6.34 mg/kg	8.26 mg/kg	1,470. mg/kg
125		Sludge Wet												
126	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
127	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
128	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
129	Overall Removal Rate		29.75%	84.21%	62.18%	72.53%	Can't Do	86.75%	67.40%	39.42%	21.73%	60.00%	85.43%	74.26%
130														
131	**SAMPLE 11**													
132	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
133	1/12/2022	Influent	2.87 ug/l	0.063 ug/l	2.79 ug/l	40.4 ug/l	10.6 ug/l	1.1 ug/l	0.0593 ug/l	1.86 ug/l	3.85 ug/l	0.4 ug/l	0.259 ug/l	87.6 ug/l
134	1/13/2022	Effluent	2.75 ug/l	0.018 ug/l	1.62 ug/l	13.1 ug/l	23.4 ug/l	0.234 ug/l	0.0111 ug/l	1.63 ug/l	3.23 ug/l	0.2 ug/l	0.044 ug/l	27.7 ug/l
135		Prim._Clar.												
136		Sludge												
137		Sludge Wet												
138	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
139	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
140	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
141	Overall Removal Rate		4.18%	71.43%	41.94%	67.57%	Can't Do	78.73%	81.28%	12.37%	16.10%	50.00%	83.01%	68.38%
142														
143	**SAMPLE 12**													
144	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
145	1/13/2022	Influent	2.99 ug/l	0.095 ug/l	3.78 ug/l	50. ug/l	9.01 ug/l	2.58 ug/l	0.208 ug/l	2.61 ug/l	4.47 ug/l	0.5 ug/l	0.434 ug/l	124. ug/l
146	1/14/2022	Effluent	2.76 ug/l	0.02 ug/l	1.66 ug/l	12.7 ug/l	19.9 ug/l	0.181 ug/l	0.0083 ug/l	1.47 ug/l	3.51 ug/l	0.2 ug/l	0.045 ug/l	25.1 ug/l
147	1/13/2022	Prim._Clar.	2.83 ug/l	0.043 ug/l	2.08 ug/l	22. ug/l	24.6 ug/l	0.562 ug/l	0.0261 ug/l	1.73 ug/l	3.56 ug/l	0.3 ug/l	0.232 ug/l	44.8 ug/l
148	1/13/2022	Sludge	7.91 mg/kg	1.44 mg/kg	47.8 mg/kg	665. mg/kg		31.2 mg/kg	0.002 mg/kg	10.9 mg/kg	21.6 mg/kg	6.56 mg/kg	7.11 mg/kg	1,600. mg/kg
149		Sludge Wet												
150	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
151	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
152	Primary Removal Rate:		Can't Do	54.74%	44.97%	56.00%	Can't Do	78.22%	Can't Do	33.72%	20.36%	40.00%	46.54%	63.87%
153	Overall Removal Rate		Can't Do	78.95%	56.08%	74.60%	Can't Do	92.98%	96.00%	43.68%	21.48%	60.00%	89.63%	79.76%

			Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
1	**SUMMARY DATA**													
2	Ave. Influent Conc.		3.261 ug/L	0.124 ug/L	4.582 ug/L	70.836 ug/L	9.828 ug/L	2.363 ug/L	0.131 ug/L	2.484 ug/L	4.651 ug/L	0.550 ug/L	0.462 ug/L	163.071 ug/L
3	Ave. Effluent Conc.		2.546 ug/L	0.022 ug/L	1.622 ug/L	13.900 ug/L	20.577 ug/L	0.241 ug/L	0.012 ug/L	1.511 ug/L	3.284 ug/L	0.243 ug/L	0.062 ug/L	29.729 ug/L
4	Ave. Primary Removal (ADRE)		19.45%	65.52%	42.15%	43.36%	27.00%	63.93%	10.00%	29.68%	18.84%	42.22%	64.99%	45.28%
5	Ave. Overall Removal (ADRE)		21.07%	77.49%	57.76%	76.28%	59.00%	86.37%	87.17%	35.71%	26.65%	54.62%	87.74%	76.79%
6	Effluent Variation (COV)		0.06	0.20	0.10	0.12	0.33	0.27	0.45	0.20	0.07	20.00	1.32	0.10
7	Average Sludge Conc.		7.28 mg/kg	1.29 mg/kg	45.2 mg/kg	594.25 mg/kg	#DIV/0!	28.03 mg/kg	0. mg/kg	9.49 mg/kg	20.38 mg/kg	6.24 mg/kg	6.17 mg/kg	1,517.5 mg/kg
8	Ambient Receiving Water Conc.		0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L
9	AVE Industrial Conc.		8.8 ug/L	0.2 ug/L	12.3 ug/L	163.6 ug/L	11.4 ug/L	5.4 ug/L	0.4 ug/L	5.5 ug/L	10.6 ug/L	1.0 ug/L	0.9 ug/L	297.6 ug/L
10	**SUMMARY (ABOVE)**													
155	**SAMPLE 13**													
156	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
157	1/14/2022	Influent	2.99 ug/l	0.051 ug/l	2.72 ug/l	39.3 ug/l	11.7 ug/l	0.941 ug/l	0.0699 ug/l	1.94 ug/l	3.98 ug/l	0.3 ug/l	0.204 ug/l	72.5 ug/l
158	1/15/2022	Effluent	2.57 ug/l	0.025 ug/l	1.64 ug/l	15.7 ug/l	22.5 ug/l	0.21 ug/l	0.0077 ug/l	1.64 ug/l	3.65 ug/l	0.2 ug/l	0.034 ug/l	26.2 ug/l
159		Prim._Clar.												
160		Sludge												
161		Sludge Wet												
162	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
163	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
164	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
165	Overall Removal Rate		14.05%	50.98%	39.71%	60.05%	Can't Do	77.68%	88.98%	15.46%	8.29%	33.33%	83.33%	63.86%
166														
167	**SAMPLE 14**													
168	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
169	1/15/2022	Influent	2.9 ug/l	0.055 ug/l	2.63 ug/l	58.8 ug/l	8.54 ug/l	0.934 ug/l	0.0739 ug/l	2.38 ug/l	4.02 ug/l	0.4 ug/l	0.185 ug/l	70.9 ug/l
170	1/16/2022	Effluent	2.65 ug/l	0.018 ug/l	1.6 ug/l	15.7 ug/l	18.4 ug/l	0.18 ug/l	0.0133 ug/l	1.34 ug/l	3.57 ug/l	0.2 ug/l	0.037 ug/l	27.7 ug/l
171		Prim._Clar.												
172		Sludge												
173		Sludge Wet												
174	Aqueous	ML/RL	0.09 ug/l	0.008 ug/l	0.03 ug/l	0.05 ug/l	1.5 ug/l	0.006 ug/l	0.5 ug/l	0.03 ug/l	0.04 ug/l	0.2 ug/l	0.009 ug/l	0.5 ug/l
175	Sludge	ML/RL	0.06 ug/l	0.007 ug/l	0.06 ug/l	0.04 ug/l	0. ug/l	0.02 ug/l	5.88/29.4	0.02 ug/l	0.03 ug/l	0.09 ug/l	0.004 ug/l	0.2 ug/l
176	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
177	Overall Removal Rate		8.62%	67.27%	39.16%	73.30%	Can't Do	80.73%	82.00%	43.70%	11.19%	50.00%	80.00%	60.93%

Humacao RWWTP

Line Number

WATER QUALITY CRITERIA CALCULATIONS (in ug/L unless otherwise noted)

1	Receiving Water: (F)resh, (M)arine, (B)oth	M
2	Hardness for Use in Calculations:	0.00

		PRIOR	CAR	WATER QUALITY STANDARD							TOTAL	TOTAL	Total	Conv. Fact.		
				FRESH			MARINE				LIMITING	LIMITING	LIMITING	Marine	Fresh	Fresh
5	*POLLUTANT*	PLTNT?	GEN?	ACUTE	CHRONIC	Hhealth	ACUTE	CHRONIC	Hhealth	COMMENTS	ACUTE	CHRONIC	HH	dis/tot	Acute	Chronic
6	Antimony (i)			9000.00	1600.00	14.00			4300.00	National Toxics Rule	0. ug/l	0. ug/l	4,300. ug/l	1.00	1.00	1.00
7	ARSENIC (T)	Y	Y	339.8 ug/l	150. ug/l	10. ug/l	69. ug/l	36. ug/l			69. ug/l	36. ug/l	0. ug/l	1.00	1.00	1.00
8	ARSENIC(PENT)	Y	Y	850. ug/l	48. ug/l		2,319. ug/l	13. ug/l		FED/PRQWS	2,319. ug/l	13. ug/l	NA	1.00	1.00	1.00
9	Beryllium			130. ug/l	5.3 ug/l					Gold Book	0. ug/l	0. ug/l	NA	1.00	1.00	1.00
10	CADMIUM - Dependent on Hardness in	Y	N	#NUM!	#NUM!	10. ug/l	45.4 ug/l	10.0 ug/l		Gold Book	45.6237 ug/l	10.0604 ug/l	0. ug/l	0.99	#NUM!	#NUM!
11	CHROMIUM(HEX)	Y	N	16. ug/l	11. ug/l	50. ug/l	1,100. ug/l	50. ug/l		Federal	1,107.7543 ug/l	50.3525 ug/l	0. ug/l	0.99	0.98	0.96
12	CHROMIUM(T) - Dependent on hardne	N	N	#NUM!	#NUM!	50. ug/l	11,000. ug/l	50. ug/l		Federal	11,000. ug/l	50. ug/l	0. ug/l	1.00	0.32	0.86
13	COPPER - Dependent on Hardness in $E	Y	N	#NUM!	#NUM!	1,000. ug/l	3.63 ug/l	3.63 ug/l			4.3735 ug/l	4.3735 ug/l	0. ug/l	0.83	0.96	0.96
14	CYANIDE	Y	N	45.9 ug/l	5.4 ug/l	12,844. ug/l	1.0 ug/l	NA		Federal	1. ug/l	NA	0. ug/l	1.00	1.00	1.00
15	LEAD - Dependent on hardness in B6	Y	N	#NUM!	#NUM!	50. ug/l	209. ug/l	8.1 ug/l		Federal	219.7687 ug/l	8.4963 ug/l	0. ug/l	0.95	#NUM!	#NUM!
16	MERCURY	Y	N	2.04 ug/l	0.012 ug/l	2. ug/l	2. ug/l	0.3 ug/l		Federal	2.3529 ug/l	0.2941 ug/l	0. ug/l	0.85	0.85	1.00
17	Molybdenum	N	N							Federal			NA			
18	NICKEL - Dependent on hardness in $B	Y	N	#NUM!	#NUM!		74. ug/l	8.2 ug/l			74.7475 ug/l	8.2828 ug/l	NA	0.99	1.00	1.00
19	SELENIUM	Y	N				290. ug/l	71. ug/l		Federal	290.5812 ug/l	71.1423 ug/l	NA	1.00	1.00	1.00
20	SILVER - Dependent on hardness in B	Y	N	3.2 ug/l			1.9 ug/l	NA		Federal	2.2353 ug/l	NA	NA	0.85	0.85	1.00
21	Thallium			1,400. ug/l	40. ug/l	1.7 ug/l	2,130. ug/l	NA	6.3 ug/l	Federal	2,130. ug/l	0. ug/l	6.3 ug/l	1.00	1.00	1.00
22	Tributyl Tin (TBT)			0.460	0.063		0.370	0.010			0.37 ug/l	0.01 ug/l	NA	1.00	1.00	1.00
23	ZINC- Dependent on hardness in B6	Y	N	#NUM!	#NUM!		90. ug/l	81. ug/l			95.1374 ug/l	85.6237 ug/l	NA	0.95	0.98	0.99
24	Arsenic (inorganic)	Y	N			0.018 ug/l			0.14 ug/l	Federal	0. ug/l	0. ug/l	0.14 ug/l	1.00	1.00	1.00
25	Aluminum									National Toxics Rule	0. ug/l	0. ug/l	0. ug/l	1.00	1.00	1.00
26	Cobalt										0. ug/l	0. ug/l	0. ug/l	1.00	1.00	1.00
27	Formaldehyde										0. ug/l	0. ug/l	0. ug/l	1.00	1.00	1.00
28	free Cyanide										0. ug/l	0. ug/l	0. ug/l	1.00	1.00	1.00
											0. ug/l	0. ug/l	0. ug/l	1.00	1.00	1.00
											0. ug/l	0. ug/l	0. ug/l	1.00	1.00	1.00

Confirmed Federal

CAUTION: The values calculated in this color box are derived from the Water Quality Standards boxes below. Changing the location or order of any of the pollutants in rows 10 to 23 may corrupt the entire workbook. Boxes B5 and B6 are taken from the LOCLIMIT.XLS spreadsheet. This spreadsheet cannot function without data being entered there first.

Appendix D
Puerto Rico Water Quality Standards Worksheet

Substance	Class SB (ug/L)
Arsenic (As)	36 (AL)
Cadmium (Cd)	7.95 (AL)
Cyanide (Free CN)	1.0 (AL)
Copper (Cu)	3.73 (AL)
Chromium III (Cr+3)	---
Chromium VI (Cr+6)	50.4 (AL)
Chromium (Cr)	---
Mercury (Hg)	0.051 (HH)
Nickel (Ni)	8.28 (AL)
Silver (Ag)	2.24 (AL)
Lead (Pb)	8.52 (AL)
Selenium (Se)	71.14 (AL)
Zinc (Zn)	85.62 (AL)
Surfactants (MBAS)	500
Total Nitrogen	5,000
Total Phosphorus	1,000

Identification codes for the applicability of standards to uses. These codes include designated and existing uses.
AL = Protection of the water body for the propagation and preservation of aquatic species or species dependent on the water body.
DW = Protection of the water body for use as source of drinking water supply.
HH = Protection of the water body or aquatic life for reasons of human health.

Appendix E
Average TCLP for Sludge

Project: Humacao TBLL
all results are in mg/L
Sludge

Date	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
12/30/2014	<0.01	<1.0	**0.003**	<0.05	<0.05	<0.0002	<0.01	<0.002
01/13/2015	<0.01	<1.0	<0.002	<0.05	<0.05	<0.0002	<0.01	<0.002
03/03/2015	<0.01	<1.0	**0.002**	<0.05	<0.05	<0.0002	<0.01	<0.002
05/12/2015	<0.01	**0.2**	<0.002	<0.05	<0.05	<0.0002	<0.01	<0.002
08/04/2015	<0.001	**13.1**	<0.0001	<0.0005	<0.0008	<0.0002	<0.001	<0.01
09/15/2015	<0.01	**0.38**	<0.0005	<0.005	<0.005	<0.0002	<0.03	<0.002
11/03/2015	<0.01	**0.06**	<0.0005	<0.005	<0.005	<0.0002	<0.03	<0.002
01/19/2016	<0.01	**0.31**	<0.0005	<0.005	<0.005	**0.0004**	<0.03	<0.002
03/01/2016	<0.01	**0.3**	<0.0005	<0.005	**0.104**	<0.0002	<0.03	<0.002
05/10/2016	<0.01	**0.09**	<0.0005	<0.005	<0.005	<0.0002	<0.03	<0.002
07/12/2016	<0.01	**0.26**	<0.0005	<0.005	<0.005	<0.0002	<0.03	<0.002
09/06/2016	<0.10	**0.26**	<0.0010	<0.050	<0.100	<0.0005	<0.10	<0.010
11/01/2016	<0.10	<0.20	<0.0010	<0.050	<0.100	<0.0005	<0.10	<0.010
01/30/2017	**0.066**	**0.167**	**0.01**	**0.03**	<0.003	**0.000624**	**0.078**	<0.001
03/27/2017	<0.011	**0.171**	**0.004**	**0.019**	**0.004**	<0.0015	<0.011	<0.001
05/22/2017	<0.011	**0.252**	**0.001**	**0.012**	<0.003	**0.0007**	<0.011	<0.001
08/21/2017	<0.10	<0.050	<0.0050	<0.050	<0.050	<0.0002	<0.30	<0.020
09/18/2017	<0.10	**0.15**	<0.0050	<0.050	<0.050	<0.0002	<0.30	<0.020
02/19/2018	<0.05	**0.39**	<0.0025	<0.025	<0.025	**0.0005**	<0.15	<0.010
03/12/2018	<0.05	**0.265**	<0.0025	<0.025	<0.025	<0.0002	<0.15	<0.010

Project: Humacao TBLL
all results are in mg/L
Sludge

Date	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
05/14/2018	<0.05	**0.24**	<0.0025	<0.025	**0.025**	<0.0002	<0.15	<0.010
07/30/2018	<0.05	**0.66**	**0.003**	<0.025	<0.025	<0.0002	<0.15	<0.010
09/10/2018	<0.05	**1.53**	<0.0025	<0.025	<0.025	<0.0002	<0.15	<0.010
11/05/2018	<0.05	**0.965**	<0.0025	<0.025	<0.025	<0.0002	<0.15	<0.010
12/21/2018	<0.05	**1.13**	<0.0025	<0.025	<0.025	**0.0003**	<0.15	<0.010
03/04/2019	<0.05	**1.04**	<0.0025	<0.025	<0.025	<0.0002	<0.15	<0.010
06/03/2019	<0.05	**0.165**	**0.0685**	<0.025	<0.025	**0.0005**	<0.15	<0.010
09/09/2019	<0.05	**0.335**	**0.003**	<0.050	<0.050	<0.0001	**0.46**	<0.010
12/02/2019	<0.05	**0.495**	<0.0025	<0.050	<0.050	<0.0001	**0.26**	<0.010
01/20/2020	<0.05	**0.425**	**0.006**	<0.050	<0.050	<0.0001	<0.15	<0.010
04/20/2020	<0.05	**0.475**	**0.007**	<0.050	<0.050	<0.0001	<0.15	<0.010
07/06/2020	<0.05	<0.075	<0.0025	<0.050	<0.050	<0.0001	<0.15	<0.010
10/12/2020	<0.05	**0.375**	**0.003**	<0.045	<0.075	<0.0002	**0.25**	<0.010
01/13/2021	<0.05	**0.58**	**0.005**	<0.045	<0.075	**0.0002**	**0.23**	<0.010
04/26/2021	<0.05	**0.42**	**0.0035**	<0.045	<0.075	<0.0002	**0.29**	<0.010
07/22/2021	**0.07**	**0.99**	**0.0085**	<0.045	<0.075	<0.0002	**0.40**	<0.010
10/27/2021	<0.05	**0.26**	<0.0025	<0.050	<0.075	<0.0002	**0.44**	<0.025
01/26/2022	<0.05	**0.27**	<0.0025	<0.050	<0.075	<0.0002	<0.15	<0.025
Maximum	**0.07**	**13.1**	**0.0685**	**0.03**	**0.104**	**0.0007**	**0.46**	**<0.002**
TCLP Limits	**0.01**	**0.05**	**0.001**	**0.025**	**0.0008**	**0.0001**	**0.01**	**0.002**

Appendix F
Phenolic Compounds Regulated by Puerto Rico Water Quality Standards

Priority Pollutants

	Subtance	Classes SB and SC (ug/L)	Class SD (ug/L)	Class SG (ug/L)
+, *	Chloroform	4,700 (HH)	57 (HH)	57 (HH)
+, *	Dichlorobromomethane	170 (HH)	5.5 (HH)	5.5 (HH)
+	Toluene	15,000 (HH)	1,000 (DW)	1,000 (DW)
+, *	Chlorodibromomethane	130 (HH)	4.0 (HH)	4.0 (HH)
+	Chlorobenzene	1,600 (HH)	100 (DW)	100 (DW)
#N/A	Chloromethane	#N/A	#N/A	#N/A
#N/A	Chloroethane	#N/A	#N/A	#N/A
+, *	Bromoform	1,400 (HH)	43 (HH)	43 (HH)
+	Phenol	860,000 (HH)	10,000 (HH)	10,000 (HH)
+	1,4-Dichlorobenzene	190 (HH)	63 (HH)	63 (HH)
+	Diethyl phthalate	44,000 (HH)	17,000 (HH)	17,000 (HH)
+, *	Bis(2-ethylhexyl) Phthalate	22 (HH)	12 (HH)	12 (HH)
	Malathion	0.10 (AL)	0.10 (AL)	---
	Chloropyrifos	0.0056 (AL)	0.041 (AL)	---
	Fenthion	0.40 (AL)	0.40 (AL)	---
	Parathion	---	0.013 (AL)	---

PUERTO RICO WATER QUALITY STANDARDS REGULATION

Rule 1303, as Amended on August 2014

AL = Protection of the water body for the propagation and preservation of aquatic species or species dependent on the water body.
DW = Protection of the water body for use as source of drinking water supply.
HH = Protection of the water body or aquatic life for reasons of human health.

* = Identifies a substance that may be a carcinogen. The HH Criteria is base on a carcinogenicity risk of 10.5-5

+ = Identifies a priority pollutant.

a = For the protection of ground waters with the potential to be used or that are used as source of drinking water supply, the applicable water quality standard is the Drinking Water (DW) or Human Health (HH) criteria. For those ground waters that flow into other water bodies, the applicable water quality standard for ground waters is the most stringent criteria resulting from the comparison between the standard applicable to the classification of the water body into which it flows and the DW or HH criteria applicable to ground waters.

Appendix G
CPCS Safety Alert

Avoiding Tap Water Scalds

The majority of injuries and deaths involving tap water scalds are to the elderly and children under the age of five. The U.S. Consumer Product Safety Commission (CPSC) urges all users to lower their water heaters to **120 degrees Fahrenheit.** In addition to preventing accidents, this decrease in temperature will conserve energy and save money.

Most adults will suffer third-degree burns if exposed to 150 degree water for two seconds. Burns will also occur with a six-second exposure to 140 degree water or with a thirty second exposure to 130 degree water. Even if the temperature is 120 degrees, a five minute exposure could result in third-degree burns.

Various procedures for lowering water temperature in the home exist, depending on the method of heating. Here are some suggestions:

Electric water heaters. Call your local electric company to adjust the thermostat. Some companies offer this service at no-charge. Hot water should not be used for at least two hours prior to setting. To make the adjustment yourself, start by shutting off current to the water heater, then turn off the circuit breaker to the heater or remove the fuse that serves the heater. Most electric water heaters have two thermostats, both of which must be set to a common temperature for proper operation. To reach these thermostats you must remove the upper and lower access panels. Adjust the thermostat following the instructions provided with the appliance. Hold a candy or meat thermometer under the faucet to check water temperature.

Gas water heaters. Because thermostats differ, call your local gas company for instructions. Where precise temperatures are not given, hold a candy or meat thermometer under faucet for most accurate reading first thing in the morning or at least two hours after water use. If reading is too high, adjust thermostat on heater, according to manufacturer's instructions, and check again with thermometer.

Furnace heater. If you do not have an electric, gas, or oil-fired water heater, you probably have an on-line hot water system. Contact your fuel supplier to have the temperature lowered. If you live in an apartment, contact the building manager to discuss possible options for lowering your tap water temperature. Reducing water temperature will not affect the heating capacity of the furnace.

CPSC notes that a thermostat setting of 120 degrees Fahrenheit (49 degrees Celsius) may be necessary for residential water heaters to reduce or eliminate the risk of most tap water scald injuries. Consumers should consider lowering the thermostat to the lowest settings that will satisfy hot water needs for all clothing and dish washing machines.

Never take hot water temperature for granted. Always hand-test before using, especially when bathing infants and young children. Leaving a child unsupervised in the bathroom, even if only for a second, could cause serious injuries. Your presence at all times is the best defense against accidents and scalding to infants and young children.

Publication 5098 009611 032012

Appendix H
Long Hand Calculation of Arsenic Local Limits

HUMACAO

Long Hand Calculation of Local Limit - Arsenic

Allowable Headwork Loading (AHL) Based on Protection of Water Quality

Acute WQS, Chronic WQS, PRWQSR, and NPDES Permit Limits

POTWs are required to prohibit nondomestic user discharges in amounts that result in violation of Water Quality Standards and/or NPDES Limits.

Federal WQ criteria are found at: http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm
Puerto Rico WQS are found at: https://www.epa.gov/sites/default/files/2014-12/documents/prwqs.pdf
NPDES Limits are found in NPDES Permit # PR0025399
Where a dilution factor has been approved, the factor applies to the Water Quality Standards but not to NPDES limits.
Dilution factors applied are derived from: Best Professional Judgment - See rationale

	Y or N
Use Federal	Y

Hardness Utilized: 0

Arsenic

			Dissolved to Total Conversion Factor (CF)
Federal WQS Acute =	360	360.0 µg/L	1.00
Federal WQS Chronic =	190	190.0 µg/L	1.00
Puerto Rico Acute =	339.8	339.8 µg/L	1.00
Puerto Rico Chronic =	150	150.0 µg/L	1.00
HH =	10	10.0 µg/L	1.00
NPDES =	NA	NA µg/L	1.00

The Allowable Headworks Loadings in Table A are calculated using the following equation:

$$Lwqs = \frac{(8.34)(Ccrit)(Qpotw * Dilution\ Factor)}{(1-Rpotw)}$$

Where:

Lwqs = Maximum allowable headworks loading (lbs/day) based on NPDES permit limits or Water Quality Criteria
Ccrit= (NPDES effluent limits or WQ criteria expressed as mg/L)
Qpotw= (POTW average flow in mgd)
Dilution Factor = (1 is equivalent to no dilution factor)
Rpotw = (Overall Removal Factor as a decimal)

Table A

Federal Acute	Federal Chronic	PR Acute	PR Chronic	PR HH	NPDES
Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic
0.36	0.190	0.340	0.150	0.010	
3.89	3.89	3.89	3.89	3.89	3.89
84.00	84.00	84.00	84.00	84.00	1.00
21.1%	21.1%	21.1%	21.1%	21.1%	21.1%
Water Quality Based AHLs		lb/d			
1242.99	656.02	1173.25	517.91	34.53	

Arsenic

Calculation of most Stringent WQS AHL

$$Lwqs = \frac{(8.34\ lb/gal \times 0.01000\ mg/L \times 3.89\ mgd \times 84:1)}{1 - 0.2107} = 34.53\ lb/d$$

HUMACAO

Long Hand Calculation of Local Limit - Arsenic

Allowable Headwork Loading (AHL) Based on Sludge Criteria **Arsenic**

Maximum headwork loadings to protect sludge quality are derived based on criteria found in 40 CFR 503 in Table 1
The Allowable Headworks Loading in Table B are calculated using the following equation:

$$Lin = \frac{(8.34)(Cslcrit)(SGsldg)(PS/100)(Qsldg)}{Rpotw}$$

Where:

Lin = Allowable Headwork Pounds per Day
Cslcrit = Limiting sludge criteria (mg/kg)(Table 3)
SGsldg = Specific Gravity of the Sludge kg/L
PS = Percent solids in the sludge to disposal (%)
Qsldg = Sludge flow to disposal (mgd)
Rpotw = POTW removal efficiency (as a decimal)

The daily sludge flow and percent solids is not available
Values used are based on standard design estimation methods.

Table B

	40 CFR 503 Pollutant	Table 3 Clean Sludge (mg/kg)	Table 1 Ceiling Sludge (mg/kg)
	Arsenic	41	75
	Cadmium	39	85
Arsenic	**Chromium**	NA	NA
75	**Copper**	1500	4300
1	**Cyanide**	NA	NA
2	**Lead**	300	840
0.05835	**Mercury**	17	57
21.1%	**Molybdenum**	NA	75
	Nickel	420	420
	Selenium	100	100
	Silver	NA	NA
	Zinc	2800	

Sludge Quality Based AHL
3.46 lb/d

Arsenic

$$Lin = \frac{(8.34 \text{ lb/g X } 75 \text{ mg/L X } 1 \text{ kg/L X } 2\% \text{ solids X } 0.1 \text{ mgd}}{0.2107} = 3.46 \text{ lb/d}$$

HUMACAO

Long Hand Calculation of Local Limit - Arsenic

Allowable Headwork Loading (AHL) Based On Inhibition **Arsenic**

Literature Values for inhibition are found in Appendix G of the EPA Local Limits Guidance 2004.
The criteria used to calculate inhibition are shown in Table C for: Activated Waste
The following equation was used to derive the allowable headwork loadings shown in Table C.

For Secondary Treatment Inhibition the equation is:

$$Linhib2 = \frac{(8.34)(Ccrit)(Qpotw)}{(1-Rprim)}$$

Where:

Linhib2 = Maximum allowable headworks loading (lbs/d) based on inhibition of secondary process
Ccrit = Inhibition level (mg/L) for Activated Sludge
Rprim = Primary removal efficiency as a decimal, (if no primary - zero)
Qpotw = POTW average flow

Note: When a range has been indicated the low range value has been selected.

Table C

	Pollutant	Inhibition Secondary Activated Sludge	Nitrogen Inhibition
	Arsenic	0.1	1.5
	Cadmium	1-10	5.2
Arsenic	**Chromium**	1-100	.25-1.9
0.1	**Copper**	1	.05-.48
19.5%	**Cyanide**	0.1-5	.34-.5
3.89	**Lead**	1.0-5.0	0.5
	Mercury	0.1-1	
	Nickel	1.0-5.0	.25-.5
	Selenium		
	Silver		
	Zinc	.3-10	.08-.5

Activated Waste Inhibition Based AHL
4.03 lb/d

Arsenic

$$Linhib2 = \frac{(8.34\ lb/gal \times 0.10\ mg/L \times 3.89\ mgd)}{1 - 0.1945} = 4.03\ lb/d$$

For Anaerobic Inhibition the equation is:

Literature Values for inhibition are found in the EPA Local Limits Guidance 2004 Appendix G.
The criteria used to calculate inhibition are shown in Table D for: Anaerobic Digestion
The following equation was used to derive the allowable headwork loadings shown in Table D

$$Linhibdgstr = \frac{(8.34)*(Ccrit)(Qdig)}{Rpotw}$$

Where:

Linhibdgstr = Maximum allowable headworks loading (lbs/d) based on inhibition of Anaerobic Digestion
Ccrit = Inhibition level (mg/l) for Anaerobic Digestion
Qdig = Sludge flow to disposal (mgd)
Rpotw = POTW removal efficiency (as a decimal)

Table D

	Pollutant	Inhibition Anaerobic Sludge
	Arsenic	1.6
	Cadmium	20
Arsenic	**Chromium**	130
	Copper	40
1.6	**Cyanide**	4
0.05835	**Lead**	340
21.07%	**Mercury**	NA
	Nickel	10
	Selenium	NA
	Silver	13
	Zinc	400

Anaerobic Digestion Based AHL
3.695 lb/d

Arsenic

$$Linhibdgstr = \frac{(8.34\ lb/gal \times 1.6\ mg/L \times 0.058\ MGD)}{21.07\%} = 3.695\ lb/d$$

HUMACAO
Long Hand Calculation of Local Limit - Arsenic

Arsenic

Selection of Lowest AHL Representing Maximum Allowable Headworks Loading (MAHL)

The smallest of the above calculated values is selected as the MAHL.

Selection of MAHL lb/d										
	Federal Acute	Federal Chronic	PR Acute	PR Chronic	PR HH	NPDES	Sludge Quality	Secondary Inhibition	Anaerobic Inhibition	Maximum Allowable Headworks Loading (MAHL)
Arsenic	1242.99	656.02	1173.25	517.91	34.53		3.464	4.03	3.69496743	3.464

Calculation of the Maximum Allowable Industrial Loading (MAIL)

The domestic (uncontrollable) sources and a safety/growth factor are subtracted from the MAHL to calculate the MAIL as follows:

$$MAIL = (MAHL)(1\text{-}SF) - L_{unc})$$

Where:

MAIL = Maximum available industrial loading, lbs/day

	Arsenic
MAHL = Maximum allowable headworks loading, lbs/day	3.464
SF = Safety and Growth factor, as a decimal	10%
L_{unc} = Loadings from uncontrolled sources	0.072

Using conservative approach L_{unc} has been established using (domestic flow =average plant influent-permitted industrial flow) and average influent concentration as follows:

L_{unc} = (average Influent concentration in mg/L)(average domestic flow to POTW)(8.34)

Arsenic

L_{unc} = 3.2607143 ug/L./1000ug/mg X 2.66 mgd X 8.34) = 0.072465 lb/d

MAIL = (3.464 lb/d X (1 - 10%) - 0.072464803 lb/d) = 3.045 lb/d

Calculation of Industrial Local Limit mg/l using Uniform Allocation Method

The uniform allocation method divides the MAIL by the industrial flow and a factor of 8.34 to convert to a concentration based limit using the following equation:

$$\text{Local Limit} = \frac{\text{MAIL lb/d}}{(8.34 \times Q_i)}$$

Q_i = Total Industrial Flow, mgd 1.2253 mgd

Arsenic

Arsenic Local Limit = 3.045 lb/d divided by (8.34 X 1.2253 MGD) = **0.298 mg/L**

Appendix I
Definitions

Appendix I. Definitions

Allowable Headworks Loading (AHL)	The estimated maximum loading of a pollutant that can be received at a publicly owned treatment works (POTW) headworks that should not cause a POTW to violate a treatment plant or environmental criterion. AHLs are developed to prevent process interference or pass-through of POCs.
Applicable Criteria	A regulation, standard, or theoretically derived detrimental concentration that must be considered in developing a local limit.
Best Management Practice (BMP)	Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices used to prevent or reduce the pollution of waters of the U.S. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. (EPA definition)
Best Professional Judgment (BPJ)	Use of experience and technical expertise to determine a course of action for which a clear-cut direction is not available in statutory or research literature.
Biological Treatment	A treatment process that depends on using microbiological processes to remove pollutants or transform them to a less objectionable state.
Book Values	Numeric values that have been determined in research studies to apply to similar processes. Most information is taken from EPA's 2004 *Guidance Manual on Development of Local Limits* (EPA Publication EPA 833-R-04-002A). See also *Reference Values*.
Categorical User	An industry subject to a category listed in 40 CFR 405-471. By definition, Categorical Users are also listed as Significant Industrial Users.
Chemical Treatment	A treatment process that uses a chemical reaction to reduce pollutants, make pollutants easier to treat, or render them less objectionable. An example includes pH adjustment.
Chemically Enhanced	The addition of chemicals to the waste stream to enhance the actions of a treatment process that is already present in the system.

Cobalt (Pt/Co) Scale	The Cobalt (Pt/Co) scale is a measure of color where each unit of the scale is defined as the color induced by dissolving 1 mg/L of platinum in water using cobalt platinate as the solute.
Composting	The process of adding vegetable matter and accelerating decomposition into a humus-like substance by various micro-organisms including bacteria, fungi, and actinomycetes in the presence of oxygen. The resulting product is used for soil amendment.
Concurrent Sampling	Sampling conducted at the same time, or with a lag period approximately equivalent to the time that the flow is resident in any portion of the system. Concurrent sampling estimates how any given characteristic changes as flow moves through the system.
Conservative Pollutant	Pollutants that are presumed not to be destroyed, biodegraded, chemically transformed, or volatilized within POTW. Conservative pollutants introduced to a POTW ultimately exit the POTW solely through the POTW's effluent and sludge. Most metals are considered conservative pollutants.
Control Efficiency	The percent capture of a pollutant that is removed by a control measure installed specifically to remove that pollutant.
Criteria	Regulations or standards that may be applicable to the development of a local limit.
Design Capacity, Design Flow	The theoretical treatment capacity based on engineering studies that is typically engineered into the original design. During construction, changes may be made for a variety of reasons, which results in the final "As-Built Capacity."
Dispersion Factor	A factor that describes how air emissions mix with the ambient air after being emitted from the original source.
Domestic Waste	Domestic waste describes waste that is generated by residential and light commercial use. In practice, the calculations typically treat domestic waste as the flow that remains after all permitted industrial flow is removed from the waste stream, which does not apply a factor for non-permitted commercial waste. See *Domestic Approximation*.

Domestic Approximation	Domestic sampling typically is taken from low-flow areas; as an alternative, influent test data are used to represent domestic contributions. These data include all dischargers (domestic, commercial and industrial). Use of these data is a conservative assumption.
Domestic Strength	Waste generated solely from residential use varies appreciably between communities (for example, average biochemical oxygen demand [BOD] ranges from <180 mg/L to >300 mg/L). Using BPJ, the most typical concentration used in local limits and ordinances is 250 mg/L for BOD and for TSS.
Emission Standards	Emission standards are legal requirements governing air pollutants released into the atmosphere.
General Limit(s)	Limits that are taken from the Puerto Rico Aqueduct and Sewer Authority Rules and Regulations for Supply of Water and Sewer Services.
Guidance Document	Unless otherwise denoted, indicates the use of the U.S. Environmental Protection Agency Office of Wastewater Management. 2004. Local Limits Development Guidance. EPA Publication EPA 833-R-04-002A. July 2004.
Headworks	The point at which wastewater enters a wastewater treatment plant. The headworks may consist of bar screens, comminutor, wet wells, and/or pumps.
Headworks Analysis	The process of taking concurrent samples at the influent and the effluent of a plant, as well as at other key sites in the system, to determine how much of a pollutant is removed by the treatment system. This information is used to calculate the maximum quantity of each pollutant that can be received at the RWWTP and still meet all applicable criteria.
Implementation	Specification of how Technically Based Local Limits will be applied and which users will require routine monitoring.
Industrial Test Data	Monitoring data collected from the discharge point for each industry. For use in local limits, flow is also required to convert to the mass of pollutants contributed to the treatment system.

Industrial User	Any user that is involved in commercial business practice that discharges wastewater that was generated as part of the commercial process at a rate that exceeds domestic strength or volume to the point that its effluent requires regulation to protect the POTW treatment process.
Industry-specific Limit	A limit established in individual industrial permits to limit discharge of pollutants that could interfere with RWWTP processes or excessively use RWWTP treatment capacity. Industry-specific limits are placed directly into industrial permits, as specified in the Guidance Manual (Table 6-2, row three) and are based on a non-uniform allocation of the capacity or maximum allowable industrial loading (MAIL) available to industry. Limits may be based on a range of rationales, from implementation of BMPs to requirements to install treatment equipment sufficient to protect the RWWTP. Ideally, the POTW owner allocates pollutant loadings in a manner that does not favor any one industry or group of industries, considers the economic impacts, maintains compliance with the NPDES permit, and otherwise achieves the environmental goals of the program.
Inhibition	Inhibition occurs when pollutant levels in a POTW's wastewater or sludge cause operational problems for biological treatment processes involving secondary or tertiary wastewater treatment and alter the POTW's ability to adequately remove BOD, TSS, and other pollutants.
Interference (positive/negative)	Laboratory test methods are based on attributes of the parameters being tested. Other materials or sample attributes can interfere with achieving an accurate assessment of the parameter being tested. When the result that is obtained is higher than the actual value, this is referred to positive interference. When the result is lower than the actual value, the interference is referred to as negative interference.
Land Application	Land application is the process of spreading treated wastewater sludge onto land for agricultural purposes, improving the land's nutrient and organic matter content. Land application is subject to regulatory requirements under 40 CFR 503.
Landfill Option	Disposal of sludge in an approved landfill. The landfilling of sludge is subject to regulations in 40 CFR 257.

Lower Explosive Limits (LEL)	The minimum concentration in air at which a gas or vapor will explode or burn in the presence of an ignition source.
Maximum Allowable Headworks Loading (MAHL)	The estimated maximum loading of a pollutant that can be received at a POTW's headworks without causing pass-through of POCs or interference with treatment processes. The most protective (lowest) of the AHLs estimated for a pollutant.
Maximum Allowable Industrial Loading (MAIL)	The estimated maximum loading of a pollutant that can be received at a POTW's headworks from all permitted industrial users and other controlled sources without causing pass-through of POCs or interference with treatment processes. The MAIL is usually calculated by applying a safety factor to the MAHL and discounting for uncontrolled sources, hauled waste, and growth allowance.
Method Detection Limit (MDL)	The minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is present as determined by a specific laboratory method in 40 CFR Part 136, Appendix B.
Minimum Level (ML)	Minimum Level (ML) is the term used by EPA instead of LOQ; it is defined as the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all of the method-specified sample weights, volumes, and processing steps have been followed.
Non-conservative Pollutant	Pollutants that are presumed to be destroyed, biodegraded, chemically transformed, or volatilized within the POTW to some degree.
Non-domestic Discharge	Any discharge to the collection system from a permitted source.
Other Permitted User	A source of discharge to the POTW that has been given a discharge permit, but does not fit the definition of categorical or significant industrial user.
Overall Removal Rate	The percent removal of a specific pollutant that occurs from the point of industrial waste discharge to the NPDES-specified wastewater treatment plant discharge point.

Partition Coefficient	The percent of a specific pollutant removed across a process or the system, synonymous with "Removal Factor" and "Removal Coefficient."
Physical Treatment	Treatment that uses a physical process to reduce pollutants, make pollutants easier to treat, or render them less objectionable. Examples include settling of particles and shredding of rags and debris.
Plug Flow	Plug flow is the flow of materials through a pipe or treatment processes that does not appreciably mix contents with flow that occurred earlier or later in time.
Pollutant of Concern (POC)	Any pollutant that might reasonably be expected to be discharged to the POTW in sufficient amounts and/or concentrations to pass through treatment in objectionable concentrations, interfere with the treatment process, contaminate sludge, cause problems in the collection system, or jeopardize workers.
Positive Interfering Material	A substance that causes a higher than accurate result in a laboratory tests.
Primary Removal Rate	The percent removal of a specific pollutant that occurs from the point of entry to the point of exit from a primary clarifier. For a system with multiple treatment processes, the primary removal rate is used in calculating biological treatment inhibition.
Reference Values	Numeric values that have been determined in research studies to apply to similar processes. Most information is taken from EPA's 2004 *Guidance Manual on Development of Local Limits* (EPA Publication EPA 833-R-04-002A). See also *Book Values*.
Removal Coefficient	The percent of a specific pollutant removed across a process or the system, synonymous with "Removal Factor" and "Partition Coefficient."
Removal Factor	The percent of a specific pollutant removed across a process or the system, synonymous with "Removal Coefficient" and "Partition Coefficient."
Scrubber Equipment	Equipment installed specifically to remove a pollutant from the waste stream. In the context of local limits, scrubber equipment is used to remove metals from emissions from incinerated waste.

Significant Industrial User (SIU)	As defined in 40 CFR 403.3, all users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N; and any other industrial user that discharges an average of 25,000 gallons per day or more of process wastewater to a POTW (excluding sanitary, non-contact cooling and boiler blowdown wastewater); contributes a process waste stream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].
Site (System) Characterization	A description of the wastewater system including size, capacity, unit processes used, and industries that discharge to the system and receiving stream. The purpose of the site characterization is to create a record of what was present at the time of local limits development for future comparison when determining whether new limits are needed.
Sludge Disposal Option	The method selected to dispose of the solid materials removed from wastewater. The most frequently used options include, but are not limited to, burial in a landfill site, application to land for agricultural purposes, incineration, or conversion to commercial fertilizer.
Sludge Removal Step	Any step in a wastewater treatment plant that removes solid or semi-solid materials from the waste stream.
Standard Calculations	Calculations that follow exact equations specified in the EPA's 2004 *Local Limits Development Guidance* (EPA Publication EPA 833-R-04-002A) for each of the treatment processes found within a wastewater plant.
Surfactant	Surfactants are compounds that lower the surface tension between two liquids or between a liquid and a solid. Surfactants may act as detergents, wetting agents, emulsifiers, foaming agents, and dispersants. Surfactants may be anionic or cationic, with the vast majority being cationic. Surfactant limits are based on methylene blue active substances, which are anionic and are chiefly introduced into the wastewater stream from detergents.

Surrogate	A value adopted to complete a calculation when a true value is not available because the test data are below the ML. In such cases, EPA guidance indicates that the ML, ½ of the ML, or zero may be used. Unlike book values, surrogates are not based on previous studies or data and can cause very high differences in the removal rates calculated and consequently the final local limit. Surrogates are not used in this local limits derivation except when the effluent is below the ML and the influent is high enough to indicate that a removal rate is present.
Time Weighted Average Threshold Limit Value (TWA-TLV)	The concentration to which a worker can be exposed for 8 hours per day, 40 hours per week, and not have any acute or chronic adverse health effects (commonly accepted exposure limits identified by the ACGIH).
Total Metals	Total metals is a descriptor of metal content of a sample after all organic material has been digested using a vigorous acid digestion, It does not include metals that are tightly bound inside inorganic particles, such as grit and sand.
Toxicity Leaching Procedure	A laboratory procedure designed to predict whether a particular waste is likely to leach chemicals into groundwater at dangerous levels. Details are provided in 40 CFR Part 261.
True Color	Color is the preferential reflection or transmittance of a specific light frequency within the visible light range. True color is the color of water after filtration to remove any colored solid or colloidal materials.
Uniform Allocation	A method of developing local limits in which the mass of a pollutant that is available to industry is first determined and is then allocated as the same concentration limit to all industries.